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ORIGINAL ARTICLES

MODERN SCIENTIFIC PHOTOGRAPHY FOR ORTHODONTISTS USING A MINIATURE CAMERA*

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SCIENTIFIC recording photography is possible today with a degree of accuracy that was impossible with the equipment described in our literature when research was made on this subject in 1925 and 1926[1, 2] which was undoubtedly the best at the time. Since that time great strides have been made in photography. Lenses are more accurate in construction, and cameras are now available that are instruments of precision; besides, space in an office has become a thing of value.

With the recent advances made in cameras, equipment, and lighting, the scientific recording of facial changes by photography must be recognized as the advisable routine procedure. Lischer[3] says: "When photographs are made according to certain definite requirements, photographic records of the facial lines answer every purpose."

The convenience, rapidity, economy, and accuracy of control of the camera overbalance the advantage of a measurable third dimension of facial casts, which call for an exacting and lengthy technic and have the problem of storage difficulties.[4, 5] It behooves us to take advantage of these improvements, especially in miniature photography, which is so adaptable to our needs.

In solving the problem of accurately recording facial changes by photography the main idea was the accuracy of recording and measuring the facial changes. There was only one approach and that was the miniature camera field, if for no other reason than the high efficiency of the lens used which gives depth which would be impossible to produce with the large lens without exorbitant cost.

*Clinic presented before the Chicago Dental Society at the Midwinter Meeting, Feb. 26—March 1, 1934.

The use of a large camera which focuses four feet or more, with the equipment needed, offers no advantage when compared with a miniature camera focusing at 30 inches, using 35 mm. cinema film with enlarger, and the compact and accurately adjustable stand with accessories. Nothing but an absolute photo-readiness affords the possibility of making photography a routine office procedure such as the x-ray examination has become at this time, and this equipment has this advantage.

Added convenience and speed are gained because a diagnosis may be made directly from the negative, thus eliminating the procedure of making a print. The cost of equipment and negatives is far less than that of the larger photographic equipment now used. Economy of space is gained for these $1 \times 1\frac{1}{2}$ inch negatives take no more space than x-ray films, and the entire equipment requires only 22 x 22 inches of floor space.

To sum up the major advantages of this equipment and technic, there is the accuracy of control of the camera, the very accurate lens, close measured positioning distance, and the focusing through marked ground glass thus paralleling the axis of the lens to a definite point on the patient.

There is also to be considered the leveling of the camera table with the head and leveling the head with the gnathostatic plane bow by using round levels (which levels at all angles).

As a further check, the head is leveled by making use of the graduated measuring screens with plumb bobs on vertical cords. All told, this gives an accurately controlled technic not heretofore attainable in scientific dental or medical photography.

CAMERA AND LENS

The camera and lens, being most important, will therefore be considered first. There are several miniature cameras available, all of good quality, and any one could be adapted for our purpose. This investigation has been limited mainly to the one I prefer, so this paper will be confined to the adaptation of the Leica camera.

This camera has proved its worth in all types of photography for recording, and especially for children, mainly because of its size, shutter speed, and rapid film change. Photographs are obtained of the patient relaxed and not posed, thus giving a true record of facial deformities. This camera is also valuable for its adaptability to the study of details in almost any branch of scientific research, especially since the cost of film material is within the reach of all. Besides macro- and microphotography, excellent stereoscopic pictures are possible which are adaptable to our needs. A report of investigations in this field will be given later.

The camera (Fig. 1) may be briefly described. The body is made of a light metal alloy and measures no more than $5\frac{1}{4} \times 2\frac{1}{4} \times 1\frac{1}{4}$ inches. The weight of the camera with film chamber and spool does not exceed sixteen ounces. It is a precision built outfit equipped with a finely corrected F 3.5 lens of 2 inch focus, giving a wonderful depth of definition which raises even the background into comparatively strong relief.

This lens is not comparable with a portrait lens, which is not a precision lens. The duty of such a lens is to give a beautiful portrait, obliterating defects, not an exact record picture; therefore, no attempt was made to correct astigmatism, spherical or chromatic aberration in the lens.

For our purpose the lens must possess great power to pass light; so it must be of large aperture. At the same time it must have great depth of critical definition. Good depth of definition and a great lens rapidity are, however, incompatible unless the focal length of the lens is short. Since the negative area of this camera is small, the lens can be of short focal length. The great advantage of a short focus lens over the long focus variety is its far greater depth of definition.

This is quickly noticed when the results of the Leica 5 cm. lens are compared with those of 13.5 cm. or longer focus lenses such as would be required when using a 4×5 inch or larger negative.

In view of the fact that the infinity point is located much nearer the camera, the foreground and background can be brought into absolute focus without stopping down the diaphragm.

Fig. 1.—Leica camera.

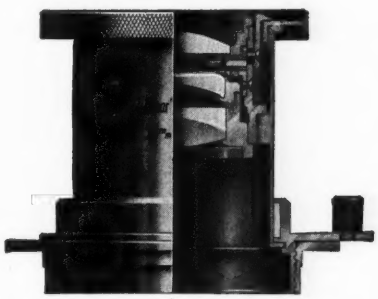

Fig. 2.—Section through the standard Leica lens.

A lens cannot be any sharper than the minimum value of the circle of least confusion; thus, a lens actually loses sharpness from too much stopping down. When the diaphragm is stopped down too far, it causes diffraction by the bending of light rays around the sharp edge of the iris diaphragm.

The Leitz 50 mm. Elmar F 3.5 lens with this camera, when stopped to F 4.5 and focused at 30 inches, has a depth of focus of 5½ inches.[6] Of the various lenses used with this camera, the Elmar lens was found to be the most advisable for this work. Comparison of this 5½ inch depth of focus to the 2 inch depth of focus which was considered sufficient in previous investigations, shows that we have made a great gain.

A comparison of the lens used in the most modern equipment recommended is all in favor of the Elmar lens. We shall compare the Elmar lens with the Rapid Rectilinear lens. The Rapid Rectilinear lens is not corrected for astigmatism and has pronounced chromatic and spherical aberration; therefore it is impossible to obtain a scientifically correct picture with a Rapid Rectilinear lens. The lens (Fig. 2) used with this camera is an asymmetrical triplet with cemented back lens, most accurately corrected within an image

field of 48 degrees. In fact, as far as correction is concerned, when used in this way this lens easily surpasses other known lenses.

The large aperture F 3.5 was obtained without undue weight increase of the optical system because of the short focal length of 2 inches. As this lens is entirely free from coma and curvature of image, and has no perceptible zonal astigmatism or the slightest degree of distortion, it is considered among the best optical systems obtainable.

The small negative ($1 \times 1\frac{1}{2}$ inch) offers a great advantage in accuracy of enlargements, since the perspective distortion in an enlargement will be exactly the same as that in the original negative which with this size is at absolute minimum. For this reason this small negative enlarged to 8×10 inches will give far less distortion than a straight 8×10 inch negative. In this way, a great improvement in reducing distortion has been made over previous endeavors.

The 2 inch lens could be used at 6 inches from the object and be as exact as a 19 inch lens used at 57 inches. However, a distance of 30 inches from the object is used, thus decreasing the liability of error or distortion by four and three-fourth times.

To use a 19 inch lens and still maintain this decreased liability of error and distortion the operator would need to work at a distance of nine and one-half times 30 inches, or 285 inches, namely, 23¾ feet. This, of course, would not be practicable, but the comparison vividly illustrates the adaptability and degree of accuracy of the lens investigated.

Let us consider the matter of detail and definition in a picture, which are due, to a great extent, to the size of the circle of confusion of the lens used in making the negative.

As we know, the circle of confusion is a sharp point with circles surrounding it. Each circle surrounding this point increases in diffusion as the diameter increases, and in some lenses the diameters of these circles of confusion are so large as to cause overlapping. When this happens there is a noticeable diffusion, and the diameter of the circle is about 1/50 inch. A circle of confusion with a diameter of from 1/150 inch to 1/200 inch is usually considered a good sharp lens. In fact, the well-known Goerz Dagor and Zeiss Tessar lenses are in this group.

The Leitz Elmar lens is designed so that the diameter of the circle of confusion is less than 1/750 inch and gives the utmost in detail and definition.[6]

These are the reasons why the negatives produced with it show a supreme depth of definition and perfect clarity of detail, as suitable for magnification as for projection.

For what can be accomplished with it, this equipment is comparatively simple to operate; there is no possibility of making a double exposure.

Eight to ten, $1 \times 1\frac{1}{2}$ inch record pictures can be made with this camera for about the same cost as making one 4×5 inch picture, thus a front view and a right and left profile can be made for about one-third the cost of one picture with the recognized type of equipment in use at this time.

The complete series of record pictures can be made in a comparatively short time, in fact, in less time than is required to make a single exposure with one of the larger type cameras.

However, all that is needed according to Simon's prescribed technic[2] is a left profile; but a front view is very valuable, and a right profile also is indicated in unilateral or mutilated conditions for a complete photographic record.

Because of simplicity and rapidity of operation and low cost, a more complete photographic record is available, thus establishing facts that make for a more complete diagnosis and prognosis. Also in legal procedures a complete photographic record of facial changes has in many cases taken precedence over plaster casts of the teeth; especially this is true where the facial contour has been changed.

FILM

The size of the film is $1 \times 1\frac{1}{2}$ inches, or what is known as double cinema size (Fig. 3), may be enlarged to 10X, and exhibits no obtrusive grain effects.

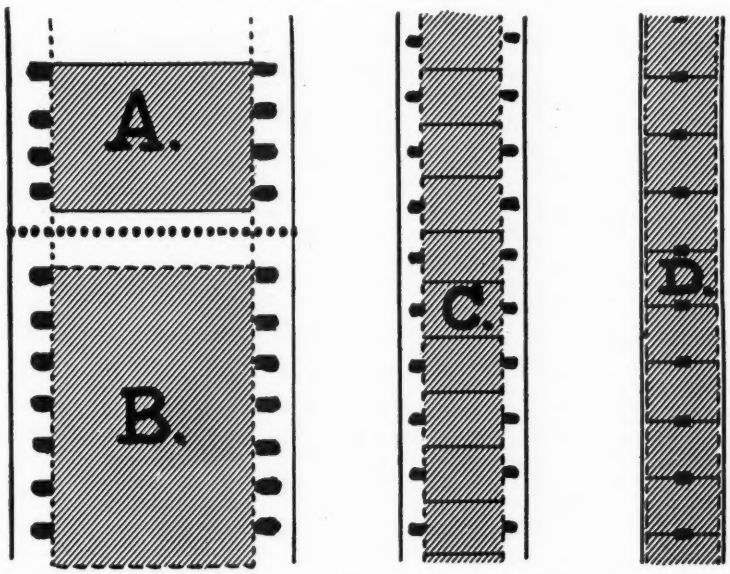

Fig. 3.—The Leica size (B) in comparison with other picture sizes of the usual cinema films: *A*, 18 × 24 mm. (standard cine size); *B*, 24 × 36 mm. (Leica size); *C*, 10.5 × 6.4 mm. (16 mm. cine size); *D*, 8.5 × 7 mm. (9½ mm. cine size). (Actual size reproduction.)

The Agfa Plenachrome fine grain film is preferable; however, another film of equally good quality is the Eastman Panatomic film.

It is an established fact that the smaller the negatives, the greater the accuracy of the subsequent enlargements, because the amount of distortion is not increased with the increase in size of the enlarged print. The actual size of a print is less important than are the accuracy and the definiteness in other respects; and so, whatever size (one-half or one-fourth) is desired, it would be adequate provided the prescribed technic was followed.

As distinct from most cameras previously mentioned, the cinematographic film, which is standardized internationally, and generally termed "standard cine film," is used for this camera.

Film manufacturers have put more effort into manufacturing this type of film than any other. The motion picture industry is very exacting in its demands and has forced the film manufacturers to do their utmost; therefore, there is the advantage of superior film due to the scientific investigation and development of the product.

The use of cinema film material in this camera is especially advantageous inasmuch as it is obtainable in all parts of the world, is produced in huge quantities, and, being required in large quantities by cinematography, is comparatively low in cost.

Another great advantage in using cine film is that the film in this camera is always perfectly flat and is stretched tight by the camera mechanism. This is important in our work since film packs as universally used at this time are not adaptable because the entire surface of the film does not always lie in the same focal plane. This causes inaccuracies from distortion and out-of-focus spots. This is true to such extent that at times it is visible to the naked eye.

The film chamber of this camera is made of metal and holds 5¼ feet of cinema film, which is equivalent to thirty-six single pictures. This is an advantage in our work, as in a busy office the matter of time lost in film changes is to be considered.

The number of photographs taken can be read off on a counting disk, and this enables the photographer to dispose of the entire unexposed film strip to advantage and when a number of different pictures is being taken, the numbers may be used to identify the pictures.

On the other hand, the entire thirty-six pictures need not be exposed before the film chamber is removed and they are developed, but any number may be exposed and by merely winding the film back and cutting the exposed piece off in the dark room they may be developed immediately. However, except in emergencies, it is well to expose the entire strip before removing and developing.

LIGHT

In record photography the lighting of the subject is particularly important, and with this technic, intensity and concentration of light are featured (Figs. 4 and 5). There is little comparison in the amount of illumination of the 500 watt lamp at the distance used with the most modern equipment and the three Photoflood lamps of 750 watts each, or 2,250 watts. These lamps have individual round reflectors, and this assembly is mounted above the camera and placed 30 inches from the patient. Since the light assembly is an integral part of the camera stand, every photograph is taken under exactly the same lighting conditions.

The 2,250 watts of light amount to an even greater gain in illumination than is apparent. The new Photoflood lamps are the most nearly perfect of modern photographic illumination, possessing the correct actinic value for photographic purposes; in fact, the actinic value is greater than that of any other lamp manufactured. The light of the Photoflood lamp differs from that

emitted by the ordinary mazda lamp in that it contains a considerably larger amount of blue and violet. This makes it suitable for both orthochromatic and panchromatic films.

The distance of the camera from the subject does not affect the exposure; however, the distance of the lights from the subject has a direct bearing on the exposure. The intensity of light varies inversely as the square of the distance. The average life of these lamps is two hours; if they last longer, they rapidly lose in intensity, and a complete new set is advisable to maintain an equal balance of light.

This illumination is economical, compact, flexible, easily adjusted, and light in weight. As the patient is entirely free from all shadows which tend

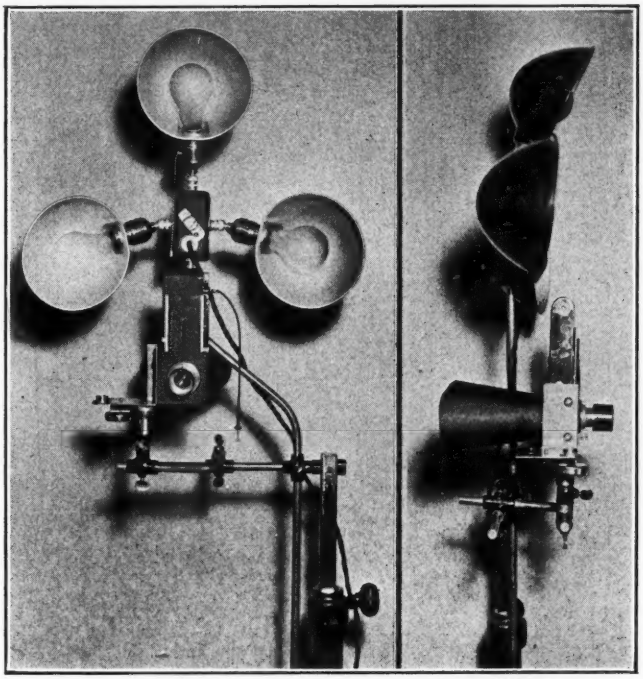

Fig. 4. Fig. 5.

Fig. 4.—Front view of camera stand, table with camera mounted, and light assembly.
Fig. 5.—Side view of camera stand, table with camera mounted, and light assembly.

to hide the changes in the lines of his face, a well-balanced negative free from all damaging shadows can be secured.

To overcome any strain on the patient's eyes due to the intense illumination, one light at a time is switched on dim until the patient becomes accumstomed to the lights, when they may be switched on bright (the patient at no time looks up into the lights); or if desired a diffusion screen of Japanese silk is stretched between the subject and the lamps at a safe distance. Although this absorbs about 40 per cent of the light, we should still have far more illumination than previously advised as we are using four and one-half times as much light.

Any dull, plain, dark shade may be used for background. In this investigation a dark green or gray shade was found to be exceptionally good.

STAND

The stand, while built heavy enough to afford a stable support for the camera, is very flexible, making adjustments possible at any angle and at any height (Fig. 6). The table holding the camera assembly has a round level mounted on it to permit absolute accuracy in leveling the camera, which is easily done with the universal adjustments available. Fastened underneath this table is a tape measure which is used to obtain the exact distance from camera to patient when focusing.

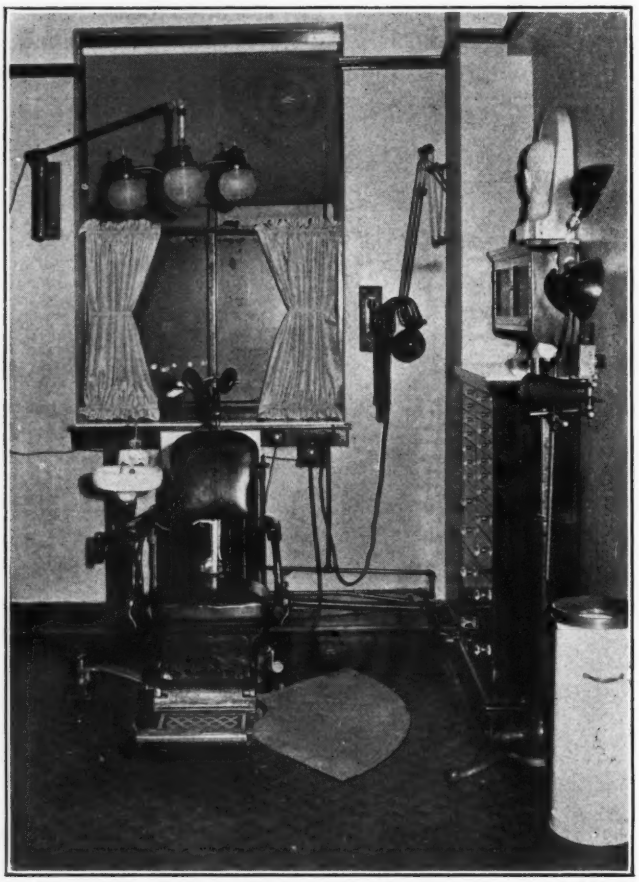

Fig. 6.—Camera stand complete as placed in operating room when not in use.

The camera stand also carries the lighting assembly, consisting of a switch box and three reflectors with three Photoflood lamps adjusted above the camera (Figs. 4 and 5).

This lighting assembly is arranged so the lighting is directly above the camera and while maintained at a definite position can be raised or lowered with ease.

TECHNIC OF FOCUSING

When focusing is considered, the matter of exposure is also always considered, and with this equipment a short exposure of 1/20 to 1/40 second is

made as compared to an exposure of from two to three seconds with the first equipment used and 1/5 second with the most recent equipment developed.

The photographic equipment used in this investigation is adapted to Simon's method of diagnosis, but the principles involved in the procedure to obtain accurate photographs for diagnosis and record may be utilized to advantage with any system.

With this technic and equipment, the noseboard and other equipment (Simon) are unnecessary, but a counterbalanced adjustable assembly using the noseboard is made which can be attached to the stand so that those who wish to follow that technic may easily do so with the advantage of the short extension (30 inches). A special chair is unnecessary, as the dental chair is more adaptable to this technic.

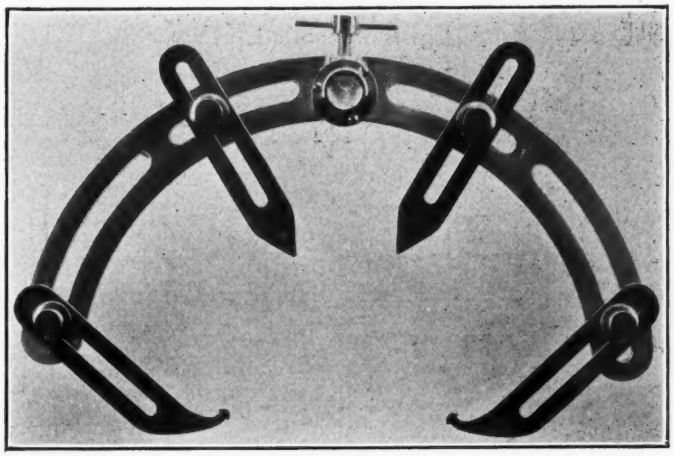

Fig. 7.—Plane bow with round level mounted in center.

The following technic allows for greater comfort and elimination of mental stress to the patient; also it makes the procedure somewhat more impersonal with the added advantages of accuracy and speed in posing.

The patient is placed in the dental chair with orbitale and tragion on right and left, also gnathion and gonion marked according to Simon. In addition, the gabella is marked in order to always definitely locate the median line for comparison of the position of the gnathion mark when taking the front view.

When these landmarks are located on the patient's face, they are marked with small disks of scotch tape which are punched out with a 2 mm. round leather punch. It has been found that the best method is to lay a strip of scotch tape, adhesive side down, on a heavy piece of cardboard, and to punch a number of disks just enough to designate them plainly. This strip remains on the cardboard, and when disks are required they may be removed easily with small tweezers, placed in position on the patient and pressed in place lightly with a small spatula. This was found to be the most efficient way to handle a more or less difficult detail in a routine procedure.

While any size disks may be used with the technic, the ½ mm. markers were not used as advised by Maller,[7] but a 2 mm. disk was used. The positions can be located better and more rapidly, besides the accuracy of measurement is as positive because bisecting a 2 mm. disk is easily done with the advantage of a larger landmark upon which to focus.

The head is leveled by using Simon's gnathostatic plane bow (Fig. 7), upon which is mounted a round level in the center. The plane bow is placed according to Simon's technic, that is, with points touching the right and left

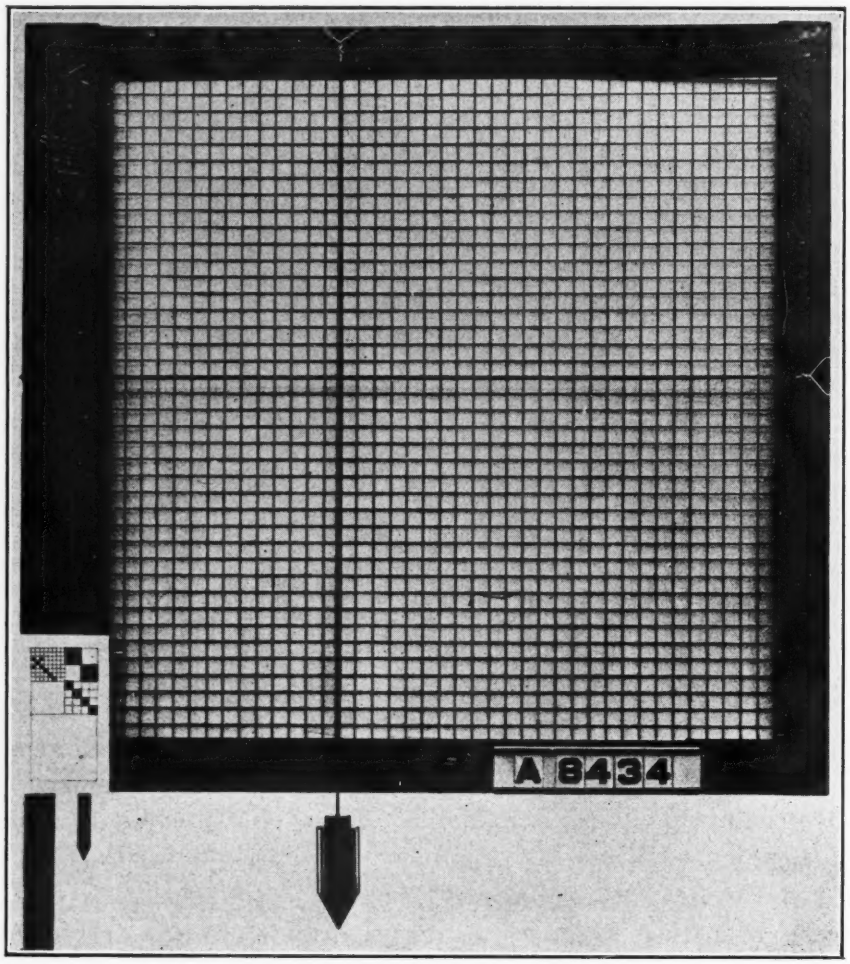

Fig. 8.—Front view of graduated screen.

orbitale and tragion and the bubble in the round level centered by tilting the head to the proper position. By this simple means the head is leveled, and the headrest on the chair, having been adjusted to the head in this position, is clamped in place. In this way, the patient's head is placed in absolute level in the horizontal and vertical planes. When this adjustment is properly made it is efficient, but as accurate an alignment may be accomplished with the plumb bobs on the vertical cords used with the graduated screens. However, this can be considered a double check either way on leveling the head with the camera.

Possibly there are many following Simon's technic who would wish to rule the various lines on the print. In that case, of course, the only additional equipment needed would be the round level which is mounted in the center hole on the gnathostatic plane bow.

I developed the method of using graduated screens (Figs. 8 and 9) so as to level the head and to have a definite and accurate method of registering and actually measuring facial change regardless of size of negative or print. Lines showing the eye-ear, median, and orbital planes are included in the photographs. By this simple method a rapid mental calculation of a change of any part of the profile or front view can be made.

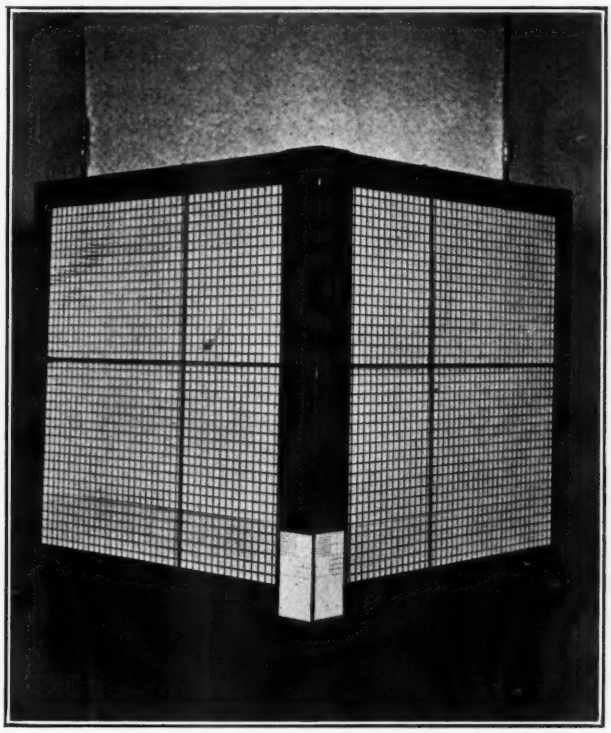

Fig. 9.—Graduated screens taken at an angle.

The screen assembly consists of a rod clamped to the dental chair arms in a horizontal position with an adjustable assembly having another rod mounted in a vertical position with front and side graduated screens mounted at right angles.

This screen consists of fine black threads accurately spaced at ¼ inch intervals both horizontally and vertically. The exact size of the squares thus formed is ¼ inch or 6.25 mm. When calculating fractions of this square, one-half graduation would be 3.12 mm., one-fourth graduation 1.56 mm., and one-eighth graduation 0.78 mm. Thus any reasonable change is easily estimated by counting the squares from a definite point (orbital or median plane), and any fraction of a square can be calibrated very easily and accurately.

The graduations ¼ inch and smaller are charted on the margin of the front and side screen. Since they are photographed on the negative, all that is needed to determine any fraction of a square is to calibrate the fraction on the picture and place it on the marked square on the margin of the screen which is in the same ratio, thus giving the desired information.

Measurements are taken directly from the negative, using the viewing desk (Fig. 15) or may be taken from an enlargement of any size. As all squares and fractions thereof are in the same proportionate ratio, the size of enlargement does not matter. The procedure would be to count the number of squares from either the median or the orbital plane, as the case may be, multiplying 6.25 mm. by this, then calibrate the fraction of square through which the facial line passes, lay this on the square photographed on the margin with fractions marked giving the desired fraction which is added to the total number of squares counted. The difference between this measurement and the original gives the amount of facial change which has taken place between the first and the last photograph.

To illustrate, the first measurement on a left profile photograph was 4¼ squares from the orbital line to facial line passing through the gnathion; 6.25 multiplied by 4, plus 1.56 equals 26.56 mm. The last measurement on this case was 5⅛ squares; 6.25 multiplied by 5, plus 0.78 equals 32.03, minus 26.56 equals 5.47 mm. facial change.

When measuring by superimposing one negative over the other, the difference in squares and fractions may be calibrated at any point measured, following the technic described above, and we know the amount of facial change at once.

However, the advisable routine procedure is to register the facial measurements when photographs are taken, and to file this information with the balance of records when making a diagnosis. When subsequent photographs are taken during treatment, the measurements of these are also placed with the records. Of course, the differences in measurement of these photographs are entered on the record sheet.

The procedure of superimposing the first and last negatives and viewing these through the viewing desk (Fig. 15) is used mainly to demonstrate more forcibly to parents the facial changes accomplished.

Before going into the matter of technic of using screens, it is well to explain at this time the letter and numbers noted on the bottom of the screen (Fig. 8), A 8434. *A* can designate the first picture taken (*B*, the second, *C*, the third, etc., during treatment); 8, age; 4, month; 34, year, giving a very convenient recording system photographed on the negative.

The graduated screens (Figs. 10 and 11) are placed at a distance of 2 inches from the head and are adjusted as follows: The vertical heavy cord on the front screen with plumb bob is adjusted to designate the median plane. This is accomplished by moving the cord to right or left; it slides freely on the top attachment. When the cord bisects the gabella marking, the alignment is accomplished.

On the side screen the vertical heavy cord with plumb bob is adjusted to designate the orbital plane. This is accomplished as on the front screen by moving the cord to right or left, sliding on the top attachment. When the cord bisects the orbital marking, this alignment is accomplished.

In the horizontal plane the adjustment is made so that the horizontal heavy cord is in alignment with the left tragion and the right and left orbital markings; this is accomplished by moving the cord up or down, sliding on side attachments. This establishes the eye-ear plane on the profile with the advantage of giving alignment through the right and left orbitale in front, thus aligning the head in the horizontal plane; and with the median and orbital vertical cords in place the head is automatically leveled in the horizontal and vertical planes because we know that the screen assembly is leveled or the heavy lines would not coincide with the light lines and the head must

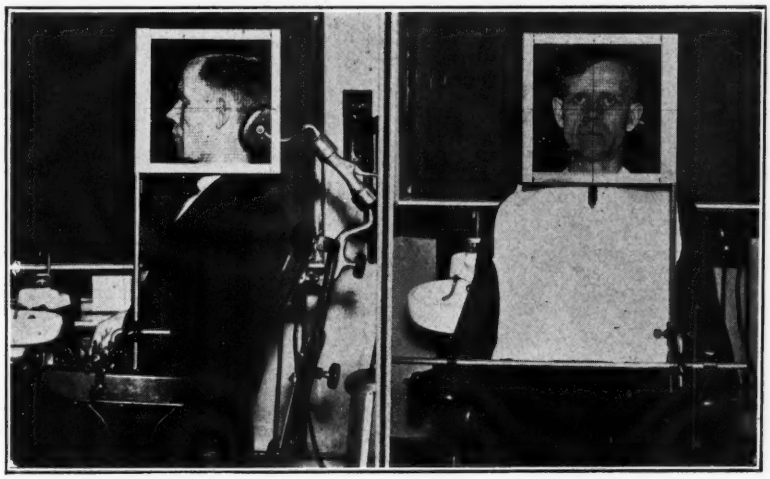

Fig. 10. Fig. 11.

Fig. 10.—Profile view with screen in position.
Fig. 11.—Front view with screen in position.

be level if the horizontal and vertical lines pass through the landmarks. If the right and left orbital markings vary (as they normally do), this same degree of variation is observed on all pictures, and so we have an accurate check on the individual for all subsequent pictures.

This automatic leveling of screen assembly and head with the accuracy possible to establish the median, orbital, and eye-ear planes is of value; but the ¼ inch squares and measuring square on the margin giving fractions, all being photographed together, give an advantage in checking that can only be realized when routinely used daily in practice.

The stand and the entire assembly are brought into position directly in alignment with the patient and placed so that the camera is exactly 30 inches from the patient. This is accomplished by running the tape out 30 inches to the tragion marking. (This tape measure is attached to the camera table as previously described.) The positioning of the stand for proper distance from the patient is done before the screens are placed.

The camera table is now leveled with the round level; thus the camera and the patient's head are on the same plane (Figs. 4 and 5). The alignment of the patient's head with the axis of the lens is accomplished as follows: The camera is focused with the adjusting mechanism by aligning through marked ground glass (horizontal and vertical lines dividing glass in half) to coincide with the heavy cords crossing at the orbital and eye-ear plane for the profile view (Fig. 12). In front of this ground glass is placed a magnifier with an adjustable collar enlarging four times, thus rendering a far more accurate means of focusing.

Now the profile view (left) being in focus, the camera is released into position, the lights are switched from dim to bright and the picture is snapped, using cable release.

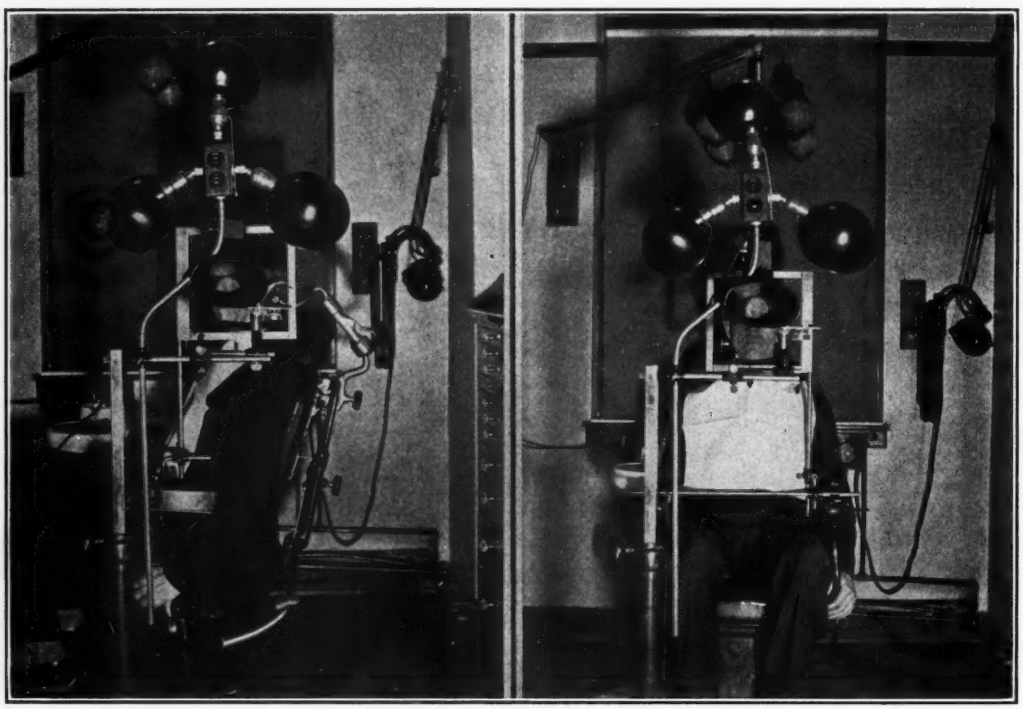

Fig. 12.—Camera in position for profile view. Fig. 13.—Camera in position for front view.

The adjustment for the front view, or full face, is now made by turning the dental chair to face the camera, the patient remaining in the same position (Fig. 13). The technic for positioning the stand and assembly is the same as that for the profile view, with the exception that the 30 inch distance is measured from the pronasion. The camera is focused with the adjusting mechanism by aligning through marked ground glass to coincide with the intersection of the median cord and the horizontal cord (which passes through the right and left orbital markings). Now the front view being in focus, the camera is released into position and the picture snapped.

The focusing of the right side in unilateral and mutilated cases is accomplished as described for the left side, but, of course, the head and screen alignments are adjusted for this side and checked for accuracy.

PHOTOGRAPHIC TECHNIC

As to the goal to be attained in accuracy of photographic technic, the following is quoted from Simon[2]: "All photographs of the same individual (taken at various intervals) and of different individuals are to be taken under the same exact conditions."

"This is accomplished because (a) the median plane of each head is always the same distance from the objective; (b) the median plane of the head and the photographic film are parallel to each other, and finally (c) the line of the lens-axis passes through both orbital points."

Also as McCoy[8] describes Simon's photostatic method: "If followed, makes it possible to obtain photographs of faces in a manner so that all are projected in the same relationship. This not only provides for the proper analysis of facial lines and proportions, but allows all subsequent photographs of patients previously taken to be reproduced under the same conditions. The importance of this is apparent if the growth changes accompanying treatment as well as those subsequent to it are to be recorded."

I have complied with all these requirements, and all that is claimed for the photostatic method is gained with added advantages. This statement is made with all due respect to the fine work done by Simon,[2] who said: "The progress of science and practice will, of course, surpass this work; but if it will serve as a stimulus to future endeavors, it will not have been written in vain."

The patient is seated in a dental chair and the headrest is adjusted according to the technic previously described for a profile, that is, the eye-ear plane is parallel to the horizontal line passing through the center of the ground glass. The orbital plane passes through the vertical line, which passes through the center of the ground glass.

The stand holding the lights and the camera is in position, 30 inches from the tragion point as a profile photograph is being taken. When the camera is leveled and the head has been leveled as previously described for the left profile (it is always presented first), the film plane is parallel to the median plane and at right angle to the eye-ear plane. The point of intersection of the eye-ear and orbitale lies in the axis of the lens, or, in other words, the line of the lens-axis passes through both orbital points.[2]

The ground glass is marked according to Simon's method by drawing two diagonals on its inner (rough) surface, and at their point of intersection lies the lens-axis. In addition a horizontal and a vertical line are drawn which pass through this intersection. Thus we have two lines upon which to focus, as these lines must coincide with the heavy cords on the graduated screen, which in turn coincide with the eye-ear and orbitale for a profile. For the front they coincide with the median and also the horizontal line which passes through the right and left orbital markings. This central point is the center of the lens-axis, and when the camera is released in place this same relation is maintained.

The Universal focusing copy attachment which gives a simple and accurate method of focusing (Fig. 14) is used: (1) light shield to prevent stray light from entering the camera opening while focusing; (2) threaded opening for securing the attachment to a tripod, extension arm of the reproduction stand, or the sliding arm for use with the upright pillar of the Leica enlarger; (3) dove-tail groove into which the sliding plate (No. 8) moves while focusing and making exposures; (4) stop for use when changing from focusing to photographing position; (5) Leica lens screwed into position; (6) clamping ring for holding the Leica camera securely to the sliding base plate; (7) key for turning clamping ring (No. 6); (8) sliding base plate for holding the Leica camera, focusing ground glass and also the magnifier; (9) focusing ground glass in exact plane with the film in the camera. There is also a place to clamp in the magnifier when necessary; (10) space cut from the sliding plate (No. 8) to permit the Model F Leica camera to fit properly.

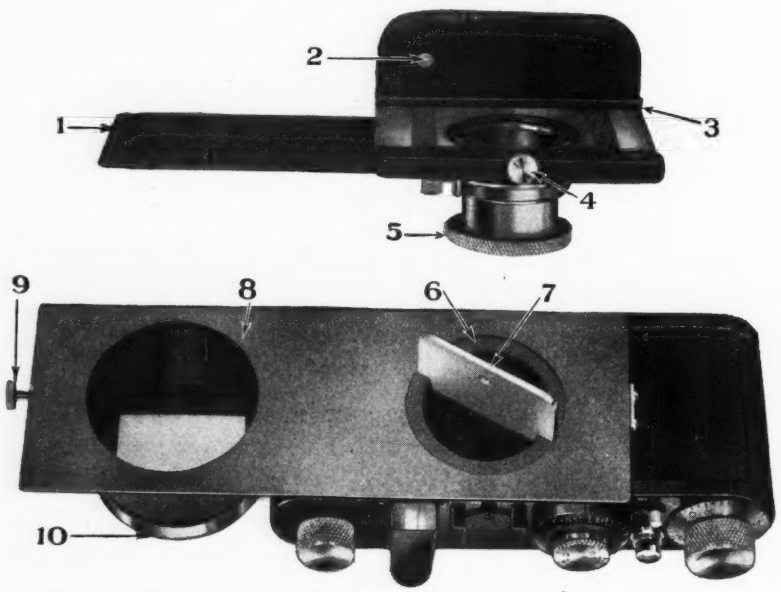

Fig. 14.—Focusing copy attachment showing the method of assembling.

To continue with the technic, the lights are now turned on in gradual steps; the camera is focused; the lens diaphragm is set at F 4.5 and an exposure of 1/20 second is made, this being the desired procedure at this time. If a particularly nervous patient is photographed, an exposure of 1/40 second at F 3.5 can be used to eliminate all possibilities of a blurred picture. A cable release is used to eliminate the possibility of vibration being transferred to the camera.

The profile picture is made first with positioning distance 30 inches, and the technic is followed as previously described. The stand is then moved away, the chair rotated, the stand moved back to positioning distance of 30 inches for front view, and the same technic followed. Care must be taken that the patient does not move after once positioned and that the horizontal or eye-ear plane line, which in the front view passes through right and left

orbitale, and the median line which passes through gabella and at right angle to the eye-ear plane are not disturbed, as they must coincide with the horizontal and vertical lines in the ground glass when focused. The height of the table is not changed after the eye-ear plane of the head is once established with the lens-axis. The entire technic when all the principles involved are understood is very simple, and yet it is so accurate that any number of negatives made in this way of the same subject can be superimposed and made to coincide as one picture.

DEVELOPING AND ENLARGING

If developing is done in the office, the advisable equipment is the Reelo tank or Correx tank. Either prepared developers or those made up according to formulas may be used.

The prescribed procedure for developing is followed with special attention to washing the film and wiping with wet chamois skin, cotton, or viscose sponge when ready for drying, thus giving a perfectly clear enlargement.

Fig. 15.—Enlarger and viewing desk.

The photographic enlarging apparatus (Fig. 15) is to all intents and purposes nothing but a small projection apparatus for short distances. The picture is projected on the table in place of a screen. If an enlargement is to be made, a piece of cardboard is cut to the desired size and used for focusing. The cardboard is placed on the table and the negative picture projected upon it. The optical system can be raised or lowered, by means of a screw, until the sharpest definition is obtained. The photo paper is placed on the cardboard and exposed according to the density of the negative. The paper is developed in the regular way.

It is much more convenient to take photographs of small size and to enlarge them subsequently. In view of the fact that the price of photographic material declines with its size, it is only logical to choose fairly small sizes. An additional advantage of small apparatus with short focus lenses is that they produce pictures of perfectly uniform definition in foreground and back-

ground. The effect of this is clearly visible on the enlargement when compared with a large original photograph.

When the enlargement is completed, it is not necessary to use trimming patterns, because all the plane lines coincide with the ground glass lines and are incorporated in the photograph. Needless to say, as the more important planes, namely, the median, orbital, and eye-ear, are photographed on the negative, only the tragion-gonion and gonion-gnathion lines have to be extended.

With the Leica enlarging-viewing apparatus (Fig. 15) and using the new viewing desk, the negative can be projected onto the desk; thus a 6×9 inch enlargement is possible, which is practical for diagnosis without going through the process of making a print. For educational demonstrations and clinics a projector (Fig. 16) may be used, giving any size projection desired. There are many advantages in using this method instead of slides. There is also the advantage of minimum storage space, since the negative can be filed with x-ray

Fig. 16.—Projector including film slide attachment.

films. The only enlargements required, when using the viewing desk, would be when records of patients leaving one's locality are transferred, for illustrating lectures and clinics when a projector is not available, and in legal procedures.

There is a place in the department of orthodontics in the university dental schools for this method and equipment. Our dental schools are becoming the centers of research, and as this method and equipment offer many advantages in this field they lend themselves to mass observation to an admirable extent.

RECORD PHOTOGRAPHS

All are agreed on the value of the profile photograph, preferably of the left side.

The front or full face photograph should be included, for reasons as stated by Delabarre[9]: "I feel that it is as necessary to take full face pictures as it is to make the profile. We get a more glaring distortion from the normal development of the face in the profile with retrusion or protrusion of the

chin than in the full face. However, we do get distortion in the full face where we have a departure from symmetrical lateral growth, and this would disclose such things as the nose or chin displaced to one side. The study of the full face is just as important as the study of the profile."

Also as advised by McCoy[8]: "Profile view as well as a front view may be taken and an effort should be made to obtain photographs showing the ordinary facial expression worn by the patient; in other words, it should show all defects exactly as they are, and at the culmination of treatment additional photographs may be made for comparison, the two sets comprising an exhibit of interest and value."

Therefore, if a complete photographic record is to be available for comparison as an aid in solving our problems in growth and development, we should make use of a complete photographic survey at definite intervals throughout this entire period.

SUMMARY

1. The adaptability of the miniature camera for record photography especially for children must be recognized.

2. The miniature camera is economical both in cost and in operation, is very exact, and has great shutter speed and rapid film change.

3. The precision built, finely corrected F 3.5 lens of 2 inch focus that is used as compared to the large type is far superior for our exacting demands.

4. The double cinema size film used and the method of stretching it on a flat plane make for efficiency.

5. The ease in developing and enlarging, besides the advantage of diagnosing from the negative with the aid of the viewing desk is an advantage that heretofore has been unattainable.

6. The number of pictures taken without change, the low cost and the high quality of the film are added advantages.

7. An intensity and a concentration of light with the correct actinic value are possible with this camera. This source of illumination is economical, compact, flexible, easily adjusted, and light in weight.

8. The exact positioning of light and camera at short distances gives a well-balanced photograph with the elimination of all damaging shadows.

9. The elimination of focusing equipment in contact with the patient renders the focusing technic more comfortable, and the use of the dental chair is in our favor.

10. The leveling of the head by using Simon's gnathostatic plane bow with round level mounted in the center, allows for a quick and accurate leveling in both the horizontal and the vertical planes.

11. The use of the graduated screen gives a definite and accurate method of registering and actually measuring facial changes. This is accomplished regardless of the size of the negative or print. We have a scientific method of approach in the solving of our problems of growth and development. All the important lines are photographed on the negative.

12. The automatic leveling of the screen assembly and head with the speed and accuracy possible is a great advantage when used as a daily routine in practice.

13. This photographic technic having complied with all the requirements laid down by previous investigators and claiming added advantages should be used to stimulate further investigation.

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A LOW LINGUAL ARCH AND A CASE REPORT OF ABNORMAL OVERBITE

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THE presence of excessive overbite is usually found associated with Class II (posteroclusion, or distoclusion) and, to a lesser degree, with Class I (neutroclusion) cases. There is a prevailing belief today that relapses of the abnormal overbite in cases of these types occur far too frequently and the distal recurrence of the mandibular teeth is still a bugaboo to many practitioners. Relapses are generally attributed to some unknown deficiency in the patient's developmental processes, to hereditary obstacles, to faulty cooperation, or to anything apart from our control. However, in many a case a normal healthy child presents who is seriously interested in aiding us to improve the malocclusion, yet a relapse occurs. As reluctant as we necessarily may feel to respond, and granting every concession to the complex biologic involvement, questions apropos may justifiably be asked. Could it possibly have been that we were deficient in our analysis of the case? Was our mechanical application insufficient or faulty to any degree, in principle? Did we apply gentle stimuli in all necessary directions to promote growth processes and changes, or did we expect Nature to attend to that which we omitted or overlooked? Or did we effect a false and imperfect equilibrium of the parts and demand that this be retained as a permanent arrangement?

One of the necessary stimulations that should be given more serious consideration is that of vertical development. Bare mention is usually made of it in most presentations. Except for the use of vulcanite or skeleton-wire planes, the army of orthodontists who are users of lingual appliances have offered no modification of technic to assist in this most essential requisite of bony development. An illustration of the slight consideration that usually attends this subject may be made by quoting from a paper given by Ross before this Society on the subject of the treatment of distoclusion cases. He said, "Hellman tells us that the developing ramus continues to develop until the sixteenth or eighteenth year. So how can we determine the length of the bite until well along in or after the developing period? By delaying until this period, there are comparatively few bites we have to open." How can this theory be dovetailed with the concept that most cases should be completed many years before that period? Besides, does it not imply that we leave this phase of the growth to Nature, which may or may not provide it, instead of recognizing this stimulation as a part of our responsibility equally as important as the securing of a smooth curve alignment and proper jaw relationship?

Read before the New York Society of Orthodontists, March, 1933.

Bite planes of different construction still seem to be very much in use today. Bach showed a skeleton plane at our last meeting and in the November, 1932, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA a paper by Oren Oliver and Claude Wood was published describing the use of a wire plane that they chose to designate as a "guide plane," the chief objective of which is to guide the mandible forward into a proper relationship with the maxillary teeth. In describing a case, they write, "Because of the deep overbite in this case and the distoclusion which was present, a guide was used to open the bite. It was so constructed as to place the mandibular arch in normal relation with the maxillary." It is with this principle that I wish to take exception.

Consequently, it may be gathered that I decry primarily the neglect of attention to the vertical development, if not completely, then until later years, and secondly, the method of sliding the mandible bodily forward to correct its distal relationship and to overcome the overbite.

In the study of Class II, the first conclusion to which I subscribe is the one advanced that in almost all these conditions the deficiency is located in the mandible. Oppenheim concluded after extensive investigations that the anomaly consists, with few exceptions, of an undevelopment of the mandible. This confirmed the hypothesis of Stemfield, Schroeder and Greve who believed the "site of the anomaly must be sought in the mandible." Robert Dunn, speaking of arrested vertical development, claims that in the great preponderance of cases the deficiency exists in the mandible with only an occasional involvement in the same region in the maxillae.

The picture presented is a very common one: the mandibular anterior teeth bite up at the gingival line, or, if the maxillary anterior teeth protrude, the bite of the mandibular incisors is against the palate. The concave curve of the mandibular teeth from the distal cusp of the second molar to the canine is exaggerated to an extreme degree. Dunn, who has written extensively on the subject of vertical development, believes that the mandible through the arrest of vertical development in the molar and premolar region is a great factor in the production of malocclusion particularly of the extensive type of Class II.

The second definitely accepted belief is that the position of the condyle cannot be permanently changed. LeRoy Johnson presented a paper before the American Society of Orthodontists with evidence to substantiate it, that he found the condyle in the same position in all types of malocclusion. Dewey, quoting Gregory very freely, in a paper before this Society, traced the evolution of the temporomandibular articulation and found that regardless of the malocclusion the anteroposterior position of the condyle was always the same. He concluded his paper as follows: "We believe any type of orthodontic treatment tending to change the position of the condyle is objectionable. We believe that the best results can be obtained by devoting our efforts toward changing the defective parts and by leaving normal structures as they are."

Sliding the jaw forward on the plane is almost identical in principle with the exercises advanced by Rogers to stretch the pterygoid muscles. The exercises involve voluntary stretching of these muscles, while the guide plane forces an involuntary stretching. Most of Rogers' principles of exercises have been

universally hailed, accepted and incorporated into practice, but a loud dissenting voice has been raised against the pterygoid exercises as being physiologically incorrect and false, both in principle and in practice. Among those who have voiced this condemnation are Milo Hellman, Clinton Howard, Steiner, Dewey, and Delabarre.

The third leg of this contention is based on the newer theories of the centers of bone growth in the jaws. Stated briefly, after the first permanent molar is erupted, there is very slight growth in the jaw anterior to it. There is ample room for every permanent tooth to succeed its deciduous predecessor. The room that is required is for the two succeeding molars; therefore the actual growth that takes place is backward from the first permanent molar. J. Sim Wallace describes it thus: "Whether the size of the jaw is sufficient to allow of the eruption of the permanent molars depends not on insufficient growth of the part of the jaws which carry the temporary teeth, but an insufficient backward growth of the lower jaws and insufficient absorption of bone on the anterior aspect of the ramus."

We had formerly thought the growth in the maxilla was in a downward, forward and outward direction, and in the mandible in an upward, forward and outward direction. This process is true for the deciduous teeth, but growth takes place at different points to gain the space necessary for the three molars. Todd, Hellman, Keith, Wallace, Brash and others are agreed that the points of growth are the posterior surfaces of the rami of the mandible, where bone is laid down on the surface coincidental to the absorption of the anterior border. In the maxilla the backward growth is in the palate and the alveolar process. Nature balances this backward growth by swinging the lower face downward in an arc which is greater in extent than any actual forward growth.

Consequently, since the anomaly of these conditions is definitely placed in the mandible, involving the insufficiency in three planes, particularly the vertical, and since the growth forces demand a backward stimulation even more so than a forward one, and since the position of the condyle is fixed and will return to its normal articulation regardless of whatever temporary arrangement we may effect—I believe bite planes are ineffective in principle as permanent aids and inadequate to assist in any of the fundamental requirements so essential to successful end-result.

While the approach of this presentation is primarily a mechanical one, I am not unmindful that there must be a relation of the mechanics to the biologic reaction. We have all been convinced that while appliances are potent factors as agents to growth, they can only modify or stimulate to a degree, but to cause growth by appliances is quite another thing. I know that growth can often occur without the aid of mechanical stimulation and I know also that growth often does not occur when appliances are used. I, too, have observed that malocclusions of apparently similar character do not react identically to mechanical treatment. Most important is the variability of different individuals in potentiality to maintain the changed occlusion under function. Also it must be remembered that the mandible cannot be developed beyond the inherent possibilities within the bone itself.

However, as we should strive to learn more of Nature's hidden mysteries and its complex scheme of growth forces, so we should also strive to reduce to a minimum our own limitations and broaden the scope of our mechanical therapy. Are the less conscientious orthodontists to use biologic laws as an excuse or as a mask to cover their ineptness and shortcomings? We all have shortcomings, and we must grant that our better concepts of biologic laws together with our added mechanical refinements have contributed to our progress. While the biologic approach to our problem is of extreme importance, the mechanical phase must not be neglected in any imbalance of evaluation.

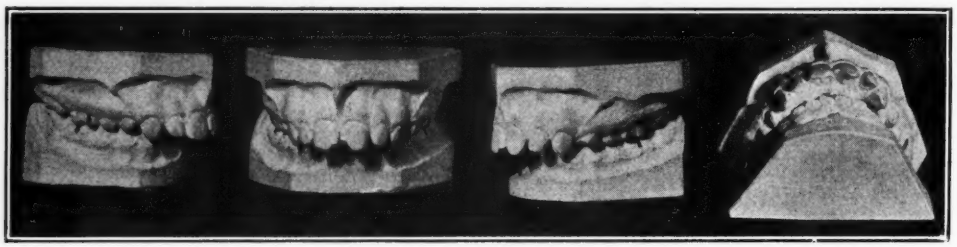


Fig. 1.—Models before treatment.

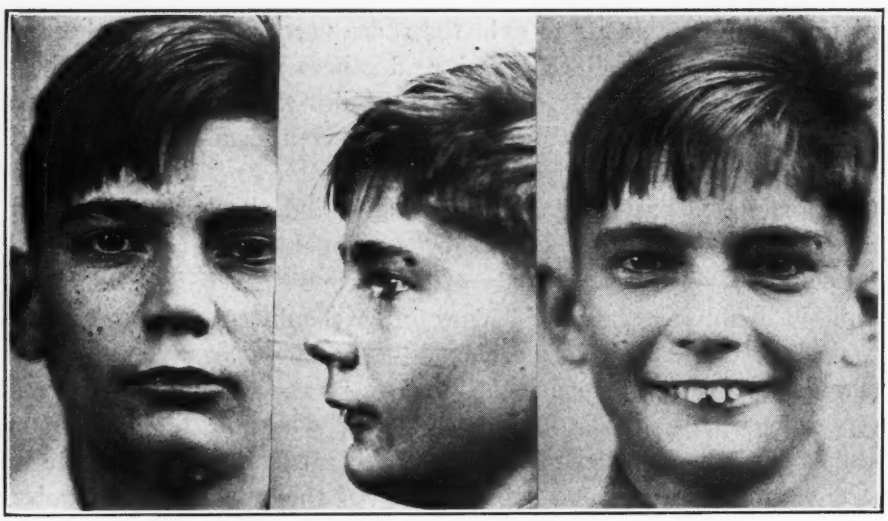


Fig. 2.—Photographs of patient before treatment.

There is practiced a routine treatment of widening the arches, producing a regular alignment, stimulating the mandible forward, with or without planes and intermaxillary elastics. There have been technics advanced to aid in vertical change, but with labial appliances. However, I have made a simple modification in the lingual arch to accomplish this, and I offer it here for whatever it may be worth. I thoroughly realize that presenting an appliance which has been successful in some instances, very likely, may or may not prove anything.

This slight refinement is made in the mandibular arch conforming with the three basic contentions: to aid in the forward growth of the mandible without affecting the temporomandibular articulation, to overcome definitely the

anomaly located in the mandible, and to aid in producing the backward stimulation that is so necessary. Whatever virtues may be claimed for planes, such as a bending or changing of the shape of the mandible, I believe to be equally supplied by the mechanics of the lingual arch.

The arch is very similar to those which have been shown by Mershon, Porter, Bach and others. The bend anterior to the half-round wire is a bit longer than for the regular lingual arch and is adjusted as low as is possible without impinging upon any of the soft tissues. In order to differentiate it from other lingual arches, I believe it should be called the "low lingual," just as we saw fit to call Lourie's modification of the labial arch, the "high labial." I have been using it for more than ten years and have found it a most useful adjunct in my practice. I make no exaggerated claims for its virtues and trust I have not been deceived in believing that it partially answers the requirements outlined herein. It has its limitations, but I do believe it has a distinct usefulness, and I shall present a case wherein completely satisfactory results were obtained.

Fig. 1 illustrates left and right side views and front view of a typical Class II case with a decided mandibular underdevelopment in the premolar and molar regions. Also it may be distinctly noted that the mandibular incisors bite as far

Fig. 3.

back in the palate as the distal half of the maxillary canine region. Fig. 2 shows photographs taken of patient at beginning of treatment, aged thirteen years.

Fig. 3 shows two models bearing typical low lingual appliances used in a case of the type shown. In addition to molar bands it will be seen that bands are fitted also to the first premolars. Occasionally as the case progresses it may be necessary to band the second premolars also or merely to shift from the first to the second premolars. On the lingual surface of these bands is soldered an attachment shaped like a staple but soldered only on one end. This permits the opening up and changing of it as the case progresses or adapting it to lock the looped spring at any time when necessary. Either end may be the soldered end depending on whatever tipping force, if any, is desired, thus controlling the actual inclination of the tooth.

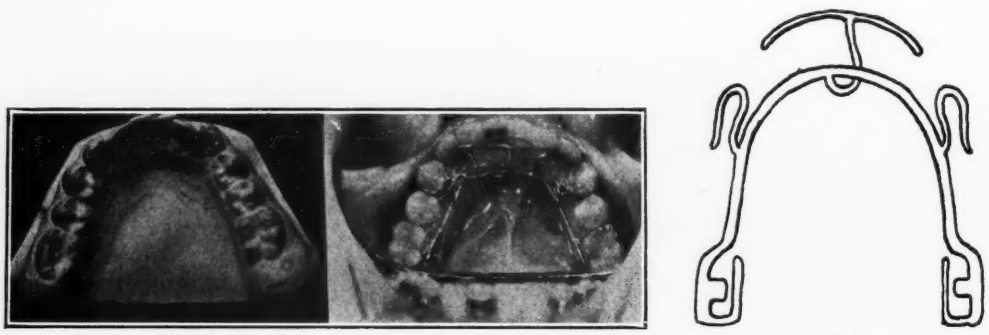
The base wire is made of 18 gauge elastic spring wire. The auxiliary components are practically divided into two sections: the anterior, which incorporates the incisors or may include the canines, as the case warrants; and the posterior, which takes care of the premolars.

The premolar control is usually but one loop spring for each side, but the anterior control may involve from one to three units. The premolar spring is shaped as much as possible, with a double loop, and can be bent to accomplish

in conjunction with its vertical force an expansion force on either or both premolars. This loop finger is bent to elevate, but at the same time can be used to tip the premolars.

The anterior units can be one T-bar for the four incisors, or two T-bars which then include the canines; or in conjunction with the one T-bar inverted-L fingers can be used to control the canines should they need individual rotation. This will necessitate banding the canines and rotating them toward the inverted-L with stainless steel ligatures. The upright of the T is of 19 gauge—either spring wire or noxidium, while the horizontal section is of 22 gauge. The canine controls are made of 21 gauge wire.

Fig. 4 shows (*A*) the mandibular model of another case at beginning, (*B*) the appliances in the mouth, and (*C*) a modification of the appliance. The appliance is adaptable to many variations, particularly additions. It will be noted that the canines are banded with spurs attached for rotations by stainless steel ligatures wrapped to the bend in the inverted-L. The end acts to swing outward the opposite surface—also can be seen a 24 gauge wire finger soldered to one wing of the T-bar. A complete loop is made and then shaped to effect the



A. *B.* *C.*

Fig. 4.

smooth curve of the anterior arch and also to aid in rotating the central incisor. This was added because I did not have time to change the complete bar. The other picture shows another type of incisor unit that can be used when more springiness is required. The upright can then be of 21 gauge elastic wire, and bent under the main arch to permit greater range of movement. This I rarely use.

This appliance may seem for the moment a magnification of the simple idea of banding another tooth, with a spur attached and permitting a curved wire to lock under it. But this simple modification is not to be considered, or used, as an arch stabilizer. It steps far ahead of any such designation and becomes a vital part of the active mechanism as a force, and converts the anchorage from a very unstable stationary type to one of a combination of a reciprocal anchorage with a definite stationary anchorage. The entire mechanics of the appliance is different from that of the ordinary lingual arch, which is usually used merely to secure a general symmetry of arch form.

The mechanics of the appliance is, simply, pitting the downward and forward pressure of the anterior segments against the upward, lateral and back-

ward pressure of the posterior segments. The plane of occlusion is being balanced by the reciprocal forces playing against each other. All these forces are generated into activity by the pull of the intermaxillary elastics attached as far mesially

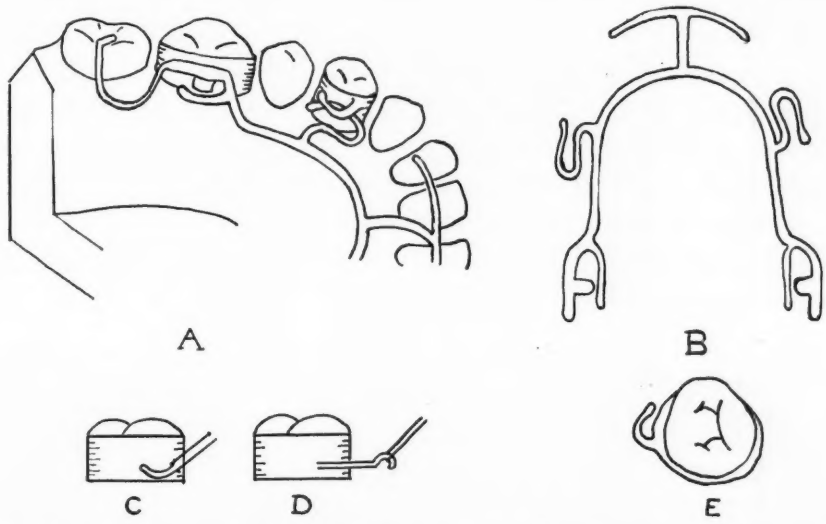


Fig. 5.—*A*, Typical appliance with distal attachment to stabilize molars. *B*, Premolar attachment on left to tip tooth distally, on right to tip tooth mesially.

Fig. 6.

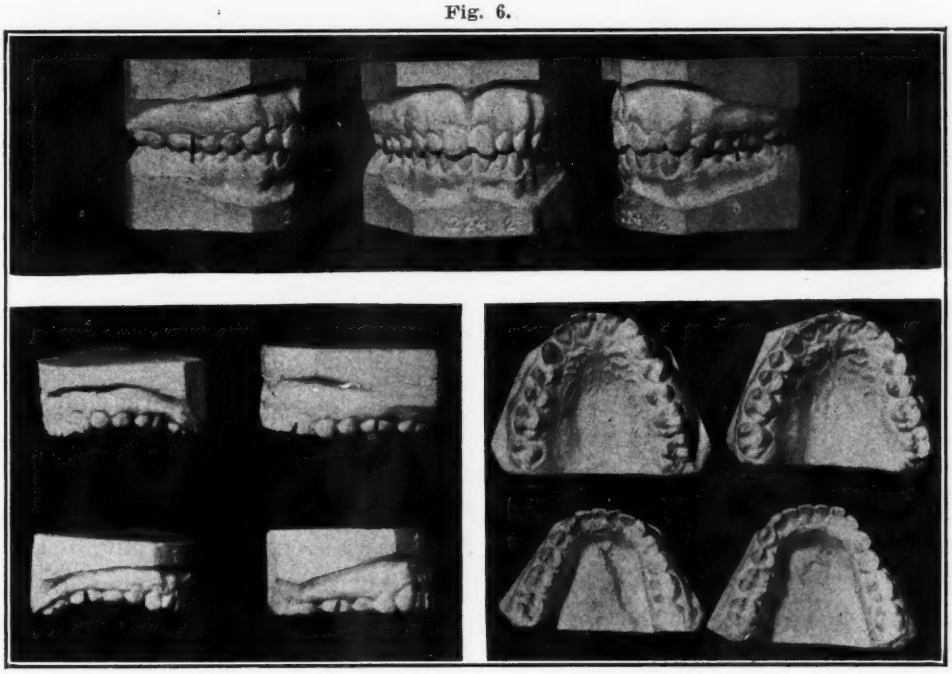


Fig. 7.

Fig. 8.

Fig. 6.—Models of completed case.
Fig. 7.—Mandibular models inverted showing extreme dip in premolar and molar region.

as possible on the molar band—at times even using hooks projecting mesially as advocated by Dr. Andrew Jackson. Thus will be seen applied stimuli suggesting growth in every direction necessary to overcome all the mandibular deficiency,

producing downward and forward stimulation in the anterior region and an upward, outward, and backward stimulation so necessary in the posterior region.

The adjustments are usually made by gently bending over and downward the T-bar as a whole, or at times, beginning with one individual wing. Hardly ever should the loop spring be opened upward, as the premolars will be unduly loosened.

In practically all other lingual arches, the strain is always borne on the molars alone, and, upon our perfect control of these teeth often depends the success or failure of every case. This is an obstacle always to be hurdled, but with the addition of the premolar band and spurs, the base wire is stabilized so that no undue rebound is to be absorbed by the molars alone; instead the posterior sections are massed as units.

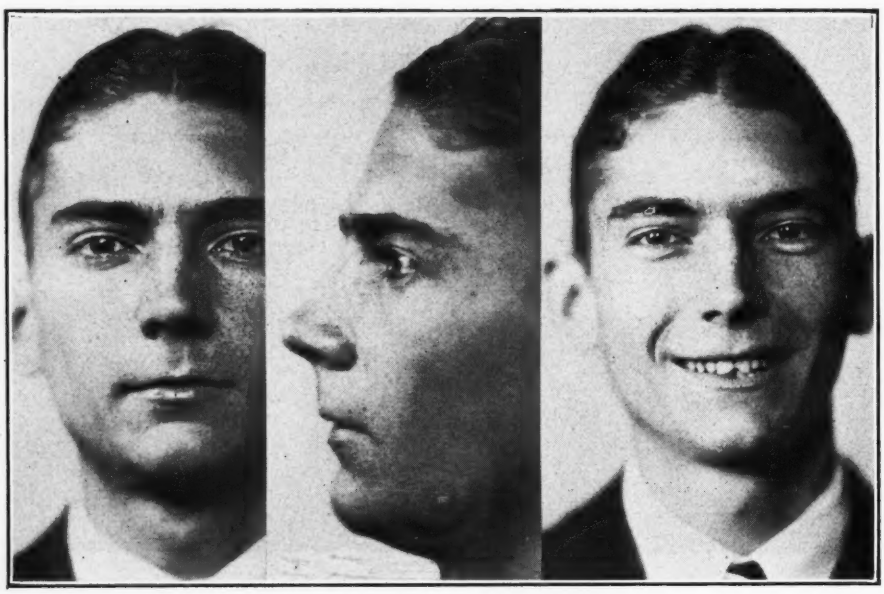


Fig. 9.

Fig. 5 *A* illustrates an attachment that can be soldered at the end of the main wire when the molar has been properly tipped or when no further elevating or tipping is needed. This is an excellent stabilizer and serves to aid in transferring all the power anterior to the molar tooth. *B* illustrates the method of shaping loop springs, attaching them, as it may be required to stimulate spring force upward either mesially or distally. *C* is the proper placing of intermaxillary hook to secure the uprighting of the mesial cusps. *D* is used in more extreme cases, also to effect the distal tipping of the molar that is so often necessary to stimulate backward growth. *E* is the shape of the spur attached to the premolars.

Fig. 6 shows left and right side and front views of completed case.

Fig. 7 shows left and right side of mandibular arch with the teeth permitted to rest on flat table. The only points touching the table are the central incisors and the distal cusps of the second molars. Note the exaggerated curve of Spee

and lack of vertical growth of the premolars and the first molars. The models on the right of this figure illustrate the same sides after treatment. This illustrates my practice of slightly overtreating all conditions. Note the improved axial position of the first and second molars as the result of distal tipping force.

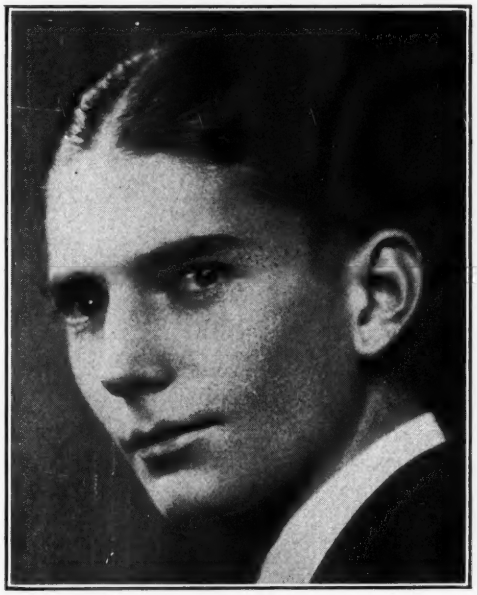


Fig. 10.

Fig. 8 shows models of occlusal surfaces of the case before and after treatment. As can be noted, very little movement was accomplished in the maxillary arch other than a retraction of the anterior teeth and the rotation of the first premolars.

Fig. 9 shows photographs of completed case, patient aged sixteen and one-half years.

Fig. 10 is a photograph sent to me by the patient eighteen months after he was dismissed. No relapse of the mandible is noted.

THE CRISIS IN ORTHODONTIA*

PART I

3. CRITICAL REVIEW OF THE PUBLICATIONS ON ORTHODONTIA BY B. GOTTLIEB, B. ORBAN, A. M. SCHWARZ AND J. A. MARSHALL†

ALBIN OPPENHEIM, VIENNA, AUSTRIA

(Continued from page 968, October)

In all my experiments I have always emphasized the advantage of the teeth of monkeys because "their structure is very similar to that of human teeth, because the straight course of their roots guarantees direct transmission of orthodontic forces to the bone, and because of the analogous anatomic relations that exist between their teeth and the compact and spongy jaw bone and those of man." The more different the anatomic conditions of man are from those of the animal used for experiment, the more cautiously must the deductions be drawn.

In studying the sections in Loos' classical monograph[5] (Figs. 2 and 3) we find that the labial compact bone of the anterior and posterior teeth is sometimes formed only by a very thin lamella of bone. In Fig. 2 (maxilla) out of each table of Loos (which for illustration of all possible varieties contains a large number of identical teeth), only one tooth of each group is taken; the teeth chosen for Fig. 2 represent about the average thickness of the alveolar wall, as shown by Loos.

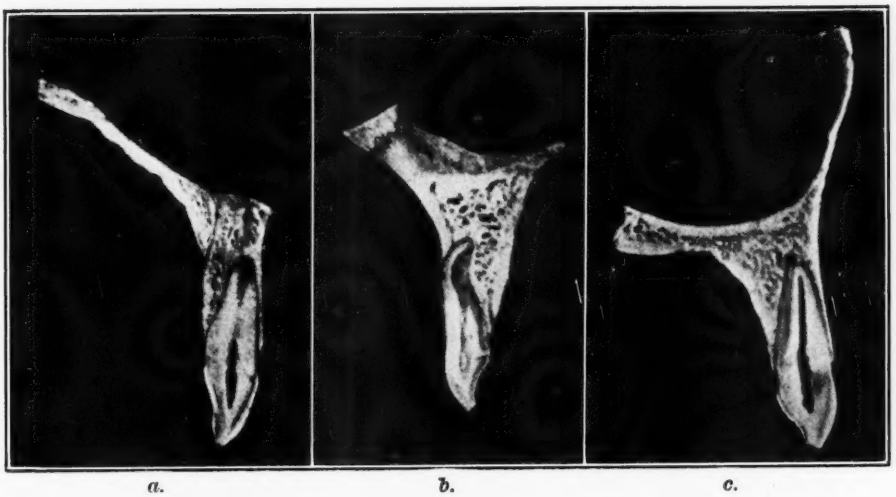
Fig. 3 shows the original table of Loos (second and third molars are omitted) and shows the cross-sections of the right half of the mandible, the teeth of which from the central incisor to the first molar are illustrated from the mesial side. Figs. 2 and 3 are reproduced in the same size as the original.

In Fig. 4 are illustrated a maxillary (1) and a mandibular (2) central deciduous incisor of a monkey (baboon) before the shedding was macroscopically visible; in these specimens we find in comparison to Figs. 2 and 3 (human teeth) nearly the same thickness of the labial wall; I performed my original experimental movements on such teeth.

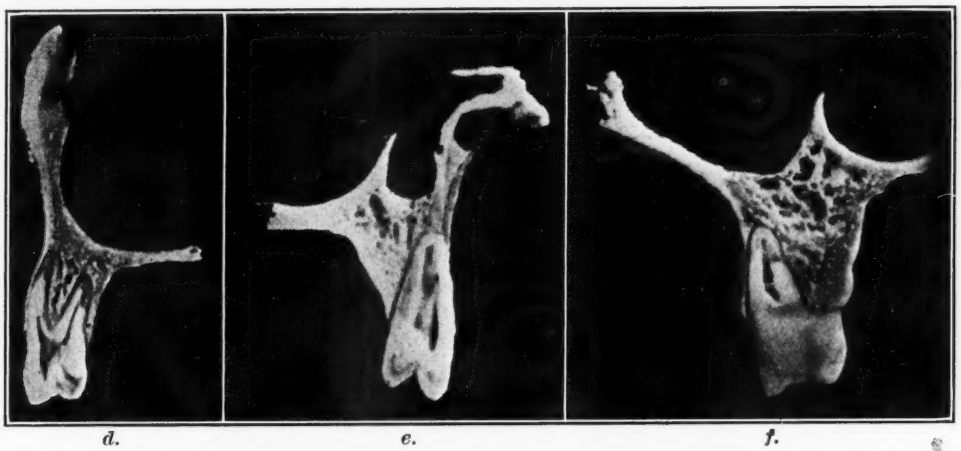
Fig. 5 illustrates the thickness of the alveolar walls in a dog, an adult animal, one and one-half years old, of unknown breed. In *a* we see photographed the mesial side of a maxillary lateral left incisor, in *b* a mandibular left central incisor, in *c* the maxillary, in *d* the mandibular first molar of the left side; in *e* is shown from the mesial side the mesial root of the left mandibu-

*From the Department of Orthodontia of the Dental Institute of the University of Vienna.

†Translated in abbreviated form from *Ztschr. f. Stomat.*, supplement to No. 22, November, 1933, published by Urban & Schwarzenberg, Vienna and Berlin.

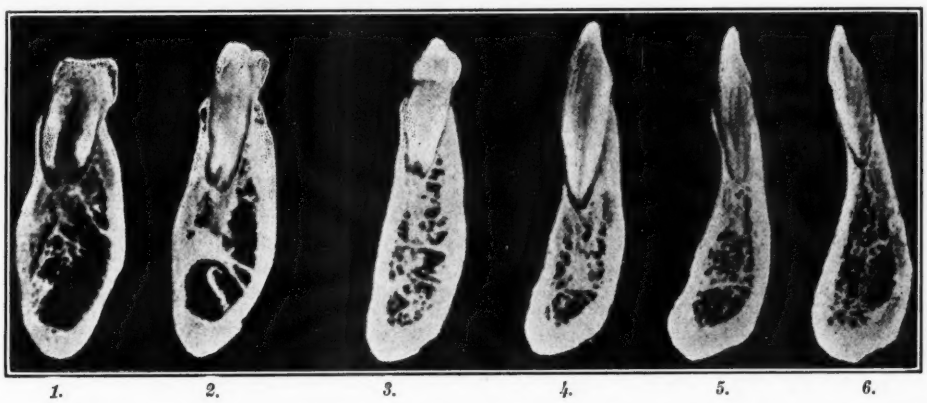


a. *b.* *c.*



d. *e.* *f.*

Fig. 2.—Ground sections through upper jaw (R. Loos): *a*, maxillary left central incisor; *b*, maxillary right lateral incisor; *c*, maxillary left cuspid; *d*, maxillary right first bicuspid; *e*, maxillary left second biscuspid; *f*, maxillary right first molar.



1. *2.* *3.* *4.* *5.* *6.*

Fig. 3.—Ground sections through mandible (R. Loos): 1, first molar; 2, second biscuspid; 3, first bicuspid; 4, cuspid; 5, lateral incisor; 6, central incisor. Second and third molars were omitted.

lar third premolar, and in *f* from the distal side the distal root of the same tooth. To give the pictures more contrast the bone and the periodontal membrane were stained with ink.

The difference in the thickness of the alveolar wall in dog and man can no doubt be discerned; especially remarkable is the massive labial alveolar

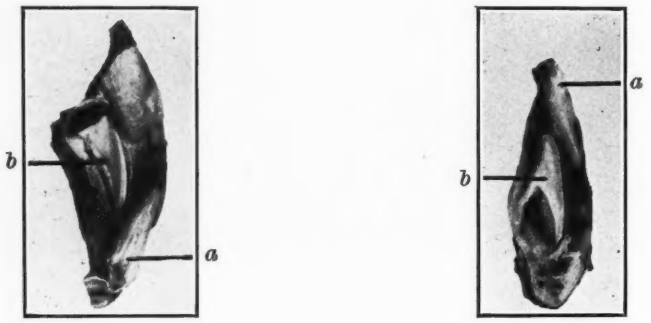


Fig. 4.—Labiolingual section through the maxillary and mandibular deciduous and permanent central incisors of a young baboon. Natural size. 1, maxilla; 2, mandible; *a*, decidous tooth; *b*, germ of permanent tooth.

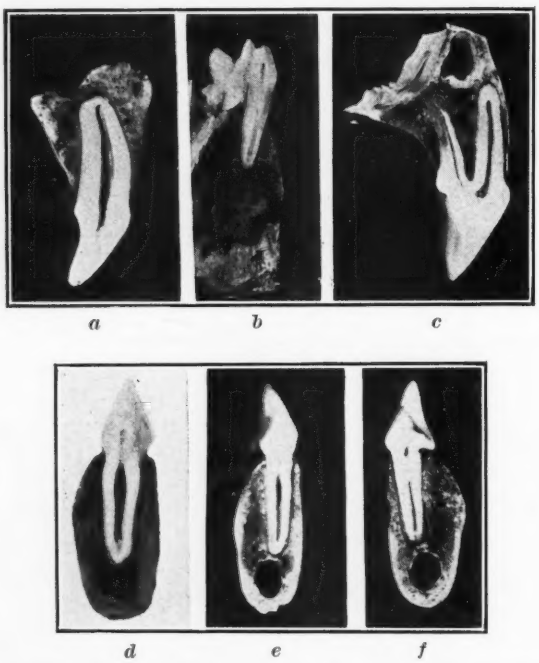


Fig. 5.—Ground sections through the jaw of a dog: *a*, maxillary left incisor; *b*, mandibular left incisor; *c*, maxillary left first molar; *d*, mandibular left first molar; *e*, mandibular left third premolar, mesial root; *f*, mandibular left third premolar, distal root.

wall of the incisors (*a, b*), the bicuspids (*e, f*), and molars (*d*) in the dog's mandible, on which teeth Gottlieb and Orban and Schwarz performed their experiments.

If we perform experiments or undertake treatment on man, we are never able to determine the thickness of the alveolar bone; therefore, it is only an

act of precaution always to assume that the bone is extremely thin and also that nature's safeguard against too great a thinning of the alveolar wall, namely, the formation of the osteophytes, may fail (INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN, Dec., 1933, p. 1207). We may appreciate the different reaction of the bone to external stimuli in different animals by the fact that, whereas in my specimens of monkeys, in using gentle forces the osteophytes are already built on the fifth day* (Fig. 6), the first appearance of new

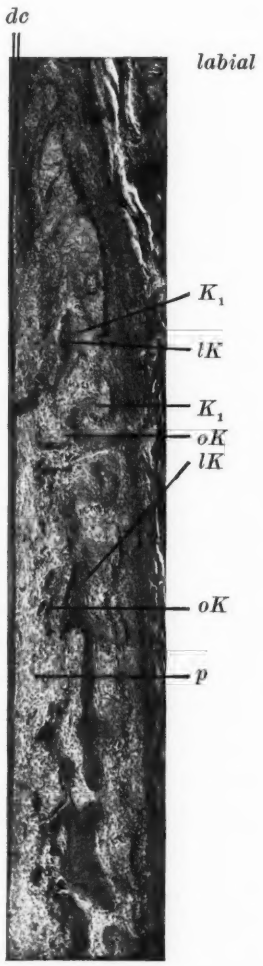


Fig. 6.—Application of gentle orthodontic force for five days. Side of pressure. Direction of movement toward the right. *d*, dentin; *c*, cementum; *p*, periodontal membrane; *lK*, compact lamellar bone; *oK*, osteoclasts; K_1, newly formed bone trabeculae (osteophytes).

bone in the dogs of Gottlieb and Orban's experiments in using very strong forces is not observed before the seventh to the tenth day. This safeguard of nature may sometimes completely fail to appear for unknown reasons, or it may be developed only quite moderately and thus endanger the tooth.

In comparing the incisors and premolars of the dog (Fig. 5), in which the compact bone plate is very thick, with the pictures of Loos (Figs. 2 and 3) and Fig. 4 (monkey), one must concede that on account of this great dif-

*Internat. J. Ortho., May, 1930, page 540.

ference in the gross anatomical structure, the results of the experiments as well as the significance of the osteophytes cannot be applied to man without restrictions.

If Schwarz writes (INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN, April, 1932, p. 339), "In all these pictures we find as a common condition regions of compression in consequence of strong forces, by which apparently the deposition of osteophytes is effected," then this statement is not in accordance with the facts; for, as the response to the direct transmission of *gentle* forces, I have shown the formation of osteophytes as early as the fifth day (Fig. 6); therefore, they can by no means be considered only as the consequence of *strong* forces.

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(To be continued.)

SOME NEW MODELS ILLUSTRATING THE EVOLUTION OF THE HUMAN DENTITION

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SEVERAL years ago at the American Museum of Natural History we began work on the Hall of the Natural History of Man, which was opened in its still unfinished state in 1932. One of the alcoves deals with the evolution of the skull, jaws and dentition, and it is for this alcove that we prepared the enlarged models of the dentition which I am showing here.

Before taking up these models in detail I may perhaps be permitted to outline in a very brief and broad way the general story of evolution from fish to man as it has gradually been deciphered as a result of the investigation of several generations of paleontologists and comparative anatomists.

Man like other animals derives the energy to carry on the business of life from the food which he wrests from other animals and plants, and this food represents so much latent energy of the sun which is caught by the green coloring matter of plants and used to build up their tissues before it is appropriated by man.

I need not refer here to the importance of the jaws and teeth of man in the business of making the potential energy in the food available to the digestive system; and I need only note that as the constant search and competition for food has been one of the great incentives for evolution, so the jaws and teeth have naturally held high values in terms of survival and prosperity of the race, so that there has been a genuine competition of different types of jaws and teeth in the same environment. But before taking up that side of the subject I desire to refer to the two great sources of our knowledge of the evolution of jaws and teeth: namely, comparative zoology on the one hand and geology and paleontology on the other.

The general results of these two sources of evidence so far as they relate to the origin of man are visualized in a wall chart in our new exhibit at the American Museum; in this chart the sequence of geologic time is represented by successive zones containing the names of the extinct groups that seem to lie nearest to the direct steps upward from fish to man, while in the top zone, representing the present time, we find what has been called the *échelle des êtres*, or scale of beings.

While in certain respects each one of these modern animals has drifted away from the true line of advance to man, the named fossil animals from successive ages certainly lie nearer to a direct series of stages from fish to man.

The jaws and teeth of man are implements by which he prepares the food for his digestive system, but they are also part of a head which is carried about by a locomotor apparatus. To understand the evolution of the jaws

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and teeth we therefore must glance first at the evolution of the locomotor skeleton. For this series of skeletons of fossil and recent vertebrates no claim is made that its members lie *exactly* in the line of ascent from fish to man. Nevertheless these skeletons are the residue, after we have rejected all the hosts of known fishes, amphibians, reptiles, birds, and mammals except these few, since the others lie at varying distances off the main line of ascent. We know this to be a fact because each individual of the hosts named above has lost by specialization one of the numerous skeletal and dental characters which the few members of the main line retained. It would be idle, for example, to put the horse or any of its relatives in the line of ascent to man, for the simple reason that even the remote ancestors of the horse were far more specialized than man in the peculiar lengthening of the middle digit and in the gradual reduction of a five-toed hand to a one-toed hand. In excluding the ancestors of the horse and of all other specialized mammals from the line of ascent to man we are only assuming the validity of Dollo's Law of Irreversibility of Evolution, which is that when an organ is once definitely lost it never reappears in the descendants of that stage. There may possibly be rare exceptions to this rule, but there is an enormous amount of evidence in its favor. So that we can safely exclude from the line of ascent to man almost all ordinary and familiar animals, which are specialized by loss of certain parts or by undue enlargement of others.

From this series it will be observed that the ancestors of man first swam like a fish, then crawled out in the swamps, using their stout pectoral and pelvic limbs as paddles; then they invaded the uplands and began to run rapidly on the ground; next they learned to climb and jump about among the trees, then began to turn the backbone up at right angles to its original position and finally came down on the ground as erect bipeds to play eventually the strenuous part of *Homo sapiens*.

It will readily be seen that all these changes in environment necessitated corresponding changes in food habits and in the jaws and teeth. I have summarized the changes that took place in the jaws and face.[1] In the lower vertebrates immediately above the grade of the sharks the jaws were very complex structures involving the inner or cartilaginous jaws and a sheathing of many derm bones. Of these the paired dentaries in the lower jaw and the paired premaxillae and maxillae of the upper were of the most importance to our present topic, since they carried the marginal teeth which are still represented in our own jaws. Gradually the inner or cartilaginous jaws, equivalent to the palatoquadrate and Meckel's cartilages of sharks, dwindled down and nearly disappeared from view, while the premaxillae and maxillae of the upper jaw and the dentaries of the lower jaw became the dominant elements finally establishing a new contact with the skull. In this connection it is lamentable that the leading textbooks on both general anatomy and dental anatomy make no mention of the thoroughly well-established fact that mammals are distinguished from all other vertebrates by the possession of a joint between the squamosal and the dentary.

The evolution of the new dentary-squamosal joint afforded a favorable starting point for the far-reaching change in the dentition which took place

in the earlier mammals; since it opened up varied opportunities for new types of movement under the influence of the paired temporal, masseter, external pterygoid and internal pterygoid muscles. Even in the higher mammal-like reptiles, which were the predecessors and near relatives of the ancestors of the mammals, the great principle of cuspidation, which was to become of predominant importance in the mammals, had already been introduced.

In textbooks of dental morphology you will see the famous diagram of the Cope-Osborn theory of the origin of the tritubercular type of molar tooth, which was that the tritubercular type had arisen from the incipiently triconodont type by the folding up of the teeth, so that the apex of the triangle was found on the inner side of the upper teeth and on the outer side of the lower teeth. But my investigations of this subject, carried on at frequent intervals since 1907, lead me to conclude that this result of reversed triangles was attained by a still more simple method, namely by the transverse extension of the inner sides of both upper and lower molars.

Be that as it may, it is at least a solid fact that before the close of the Jurassic period, about one hundred and twenty million years ago, the essential features of the pre-tritubercular upper and tuberculosectorial lower molars were already in existence. That is to say, the upper molars were triangular and extended transversely, with the apex internal; the lower molars were also triangular but much narrower transversely than the uppers and fitted into the interdental embrasures between the upper molars. A very small talonid or heel projected from the posterior base of the lower molars and, according to the evidence observed by Dr. Simpson, this talonid overlapped the inwardly projecting cusp of the upper molars.

To turn now to the models, six of these are the work of Mr. Frederick L. Thompson, three are by Mr. Christopher Marguglio, both working under my constant supervision. For copy we had the actual fossil and recent specimens before our eyes except in the case of the Jurassic pantotherian, where we used the stereoscopic views published in Dr. George Gaylord Simpson's two superb memoirs on the Mesozoic mammals of Europe and North America.

The first of the series represents the upper and lower teeth of a minute shrewlike mammal from the Jurassic period about one hundred and twenty million years ago. The second represents a small insectivorous mammal from the Cretaceous of Mongolia; the third a relatively primitive modern insectivore *Potamogale;* the fourth is another insectivore named *Didelphodus* from the Lower Eocene of Wyoming, about fifty million years ago; the fifth is an early primate, *Pronycticebus,* about forty million years ago; the sixth is a generalized anthropoid ape, *Dryopithecus,* about fifteen million years old; the seventh represents the Mousterian youth, about twenty thousand years ago; and the eighth is modern man, *Homo sapiens.* (Fig. 1.)

If we view the series of upper molars we observe that the interdental embrasures of the lower forms, which are left widely open for the reception of the sharp-cutting trigonids of the lower molars, begin to be squeezed out as the hypocones or distolingual cusps of the upper molars develop. We also see that the para- and metacones move apart as the talonid of the lower

molars widens transversely. Next we note the progressive reduction of the outer cingulum as the paracones and metacones move to the outer side.

The vertical line in the diagram separates the premolars from the molars. The diagram brings out the fact that in the lower primates there are four premolars on each side above and below, while in the anthropoid apes and in man the premolars are reduced to two, through the reduction and final elimination of the anterior two.

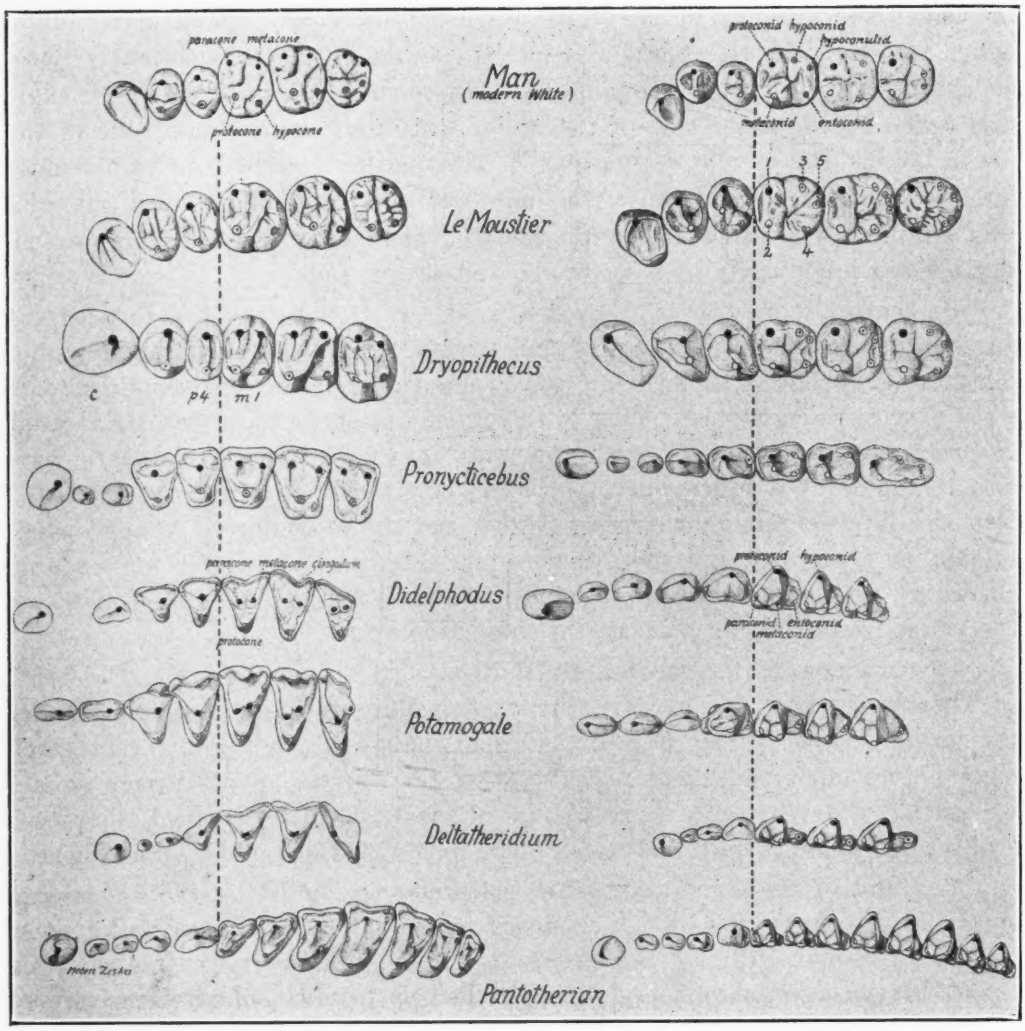

Fig. 1.—Eight structural stages in the evolution of the cheek teeth in man. Scales various.

In the lower molar series please note that in the Jurassic pantotherians the trigonids or lower triangles are all sharp with very small heels or talonids on the lingual border. In the Upper Cretaceous insectivore *Deltatheridium* the talonids are more elongate but still narrow. It is not until we reach the early primate *Pronycticebus* that the talonid slightly exceeds the trigonid in transverse width.

In the anthropoids and far more in man the lower molars have become wide and short, especially in connection with the anteroposterior shortening of the jaw and face.

The paraconid or anterointernal cusp of the old trigonid disappears in the early primates, leaving a five-cusped tooth. In modern man the first molar is usually conservative and retains five cusps and more or less of the so-called *Dryopithecus* pattern of cusps and grooves; the second and third molars depart further and further from this type. These tendencies, however, are much less developed in the fossil youth of Le Moustier.

In short, one of the most convincing bits of evidence tending to show that man is descended from a creature no higher than a Mid-Tertiary ape is the fact that the older and more primitive Hominidae inherited along with an apelike dental formula, a distinctly apelike pattern of the lower and upper molars.

In conclusion, the paleontological evidence, slowly accumulating through the years, seems to lend no support whatever to any of the numerous more recent theories of the evolution of the mammalian molar teeth in the line leading to man. There is not a shred of paleontological evidence in support of the late Professor Bolk's theory that the molar teeth of man have arisen from the fusion of three dental germs in a vertical row. Still less does the paleontological evidence support any form of the theory of concrescence, according to which a bicuspid represents the fusing of two, and an upper molar of four, simple teeth. Rather does a renewed and extended survey of all known principal types of fossil and recent mammalian dentitions convince me that, apart from the single matter of the origin of the tritubercular molar by rotation of the para- and metacones, the general theory of Cope and Osborn, according to which even the most diversified molar patterns of placental mammals have all been derived from the tritubercular type, has always had the support of great numbers of fossil and recent types of mammals which have been too lightly disregarded and ignored by opponents of the theory.

In the matter of the origin of the tritubercular molar, however, I would again put forward with renewed confidence the conclusion that I came to as a result of several previous investigations, namely, that the relation of reversed triangles subsisting between the upper and lower molars was brought about in a very simple way, not by rotation of the para- and metacones in opposite directions in both upper and lower jaws, but simply by the lingual extension of both upper and lower molars, which retained the primitive overlap of the upper by the lower and the primitive interlocking of one lower between two upper molars.

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A CONTRIBUTION TO THE SURGICAL TREATMENT OF OPEN-BITE

PROF. F. KOSTEČKA, M.D., PRAGUE, CZECHOSLOVAKIA

THE clinical types of the anomaly of occlusion known as open-bite vary considerably. The methods of orthodontic and of surgical treatment for correcting the anomalies of occlusion have the same aim, i.e., to obtain the best functional and cosmetic results. However, the methods which surgery and orthodontia employ are totally different.

The orthodontist endeavors to obtain an ideal occlusion of the teeth by appliances on the teeth, by which movement of the whole jaw will be effected; at the same time the whole jaw is reshaped because the teeth are moved by this apparatus. The results of orthodontic treatment are excellent in those cases where the cause of the anomaly lies in the dental arch.

In those cases in which the main cause of the anomaly lies in the jaw itself, orthodontic treatment is satisfactory only for children, because in adults the results are not always perfect.

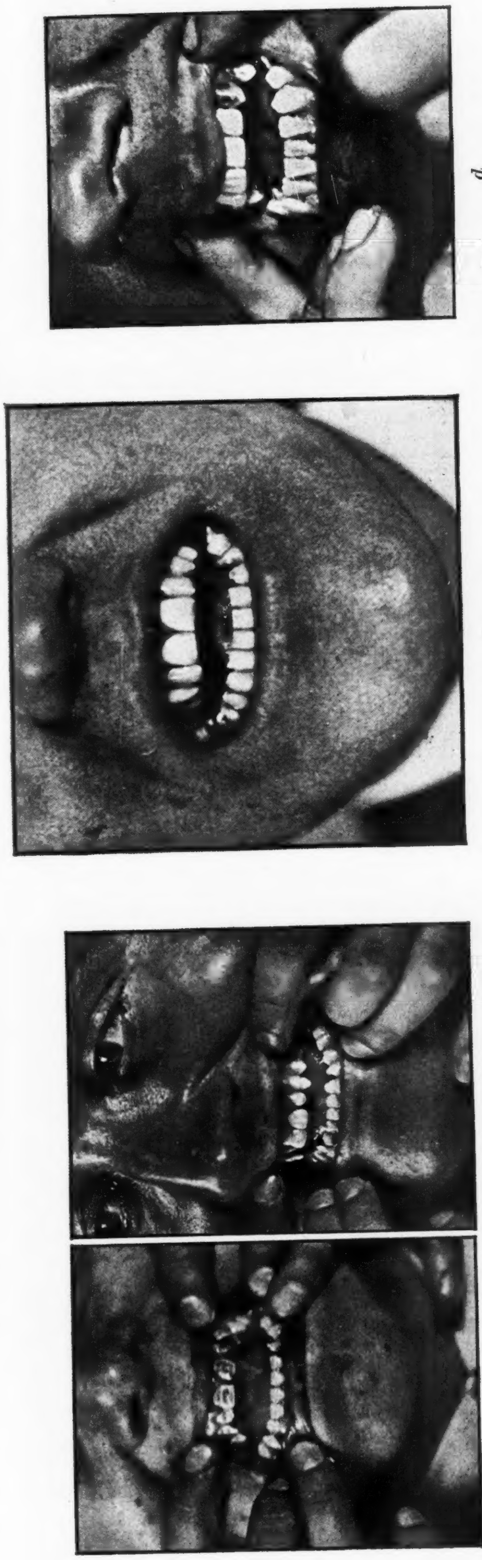
Surgical treatment tries to correct the whole jaw, or the abnormal part of it; whereby it endeavors to obtain first a cosmetic and second, as far as possible, a functional effect. The results of this treatment are successful in those cases in which the chief cause of the anomaly and deformity of the face is not in the teeth but in the jaw. By correcting the malposition of the jaw the chief cause of the deformity of the face is removed, and at the same time the function of the teeth is improved. For instance, in mandibular protrusion the chief defect lies in the mandible itself. This cannot be corrected in adults only by moving the teeth. The whole jaw can be pushed back into normal position by horizontal osteotomy of the mandibular ramus; so the operation will correct the anomaly of the face and that of occlusion at the same time.

Likewise, in retrusion of the jaws the anomaly can be corrected by a forward movement of the whole jaw.

In this article I should like to point out some cases of open-bite in which surgical treatment is advantageous.

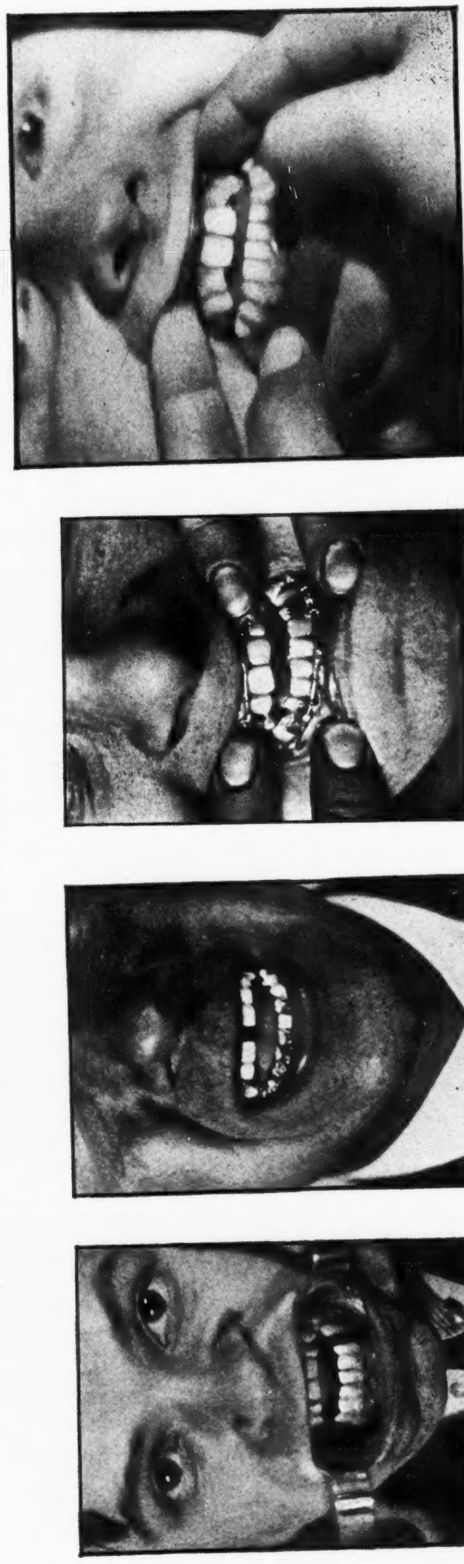
Open-bite, according to Korkhaus, is nonocclusion in a vertical direction, with eventual mesioclusion or distoclusion. The clinical types of this anomaly can vary considerably. The degree of nonocclusion differs greatly in the region of the front teeth, and can vary between 0.5 cm. and 2 cm. Sometimes besides the front teeth, the premolars and in extreme cases the first molars are not in contact when the individual is biting.

Orthodontic treatment for the correction of this defect is certainly the ideal method. However, every experienced orthodontist knows that in some advanced cases of this anomaly orthodontic treatment is very difficult. It takes a long time to correct this malocclusion, and in some cases after the patient is fifteen years old, it is quite useless to attempt orthodontic treatment.



a *b* *c* *d*

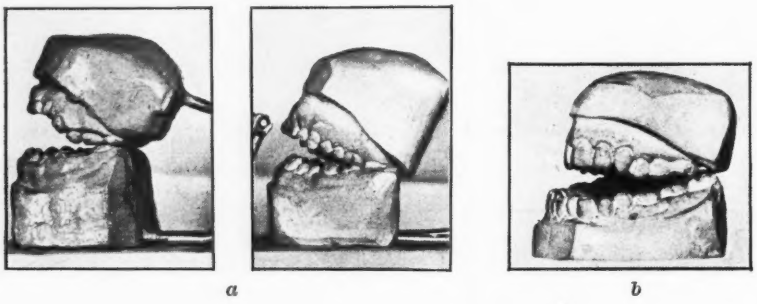
Fig. 1.—Open-bite in which surgical treatment is suitable.



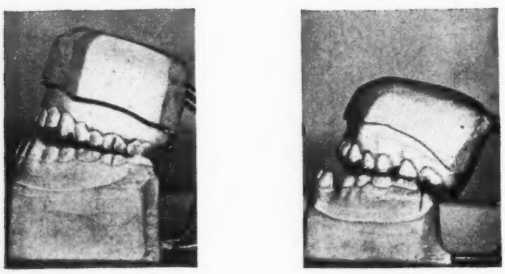
a *b* *c* *d*

Fig. 2.—Open-bite combined with mandibular protrusion in which surgical treatment is suitable.

Some experienced orthodontists can pride themselves upon one or two cases of large open-bite corrected in adult persons by orthodontic treatment. Every one must confess, however, that the treatment is connected with great trouble for both orthodontist and patient. One can never be sure of a satisfactory result beforehand. Since people afflicted with this anomaly suffer from disfunction of



a *b*



c *d*

Fig. 3.—Plaster models of open-bite cases suitable for surgical treatment.

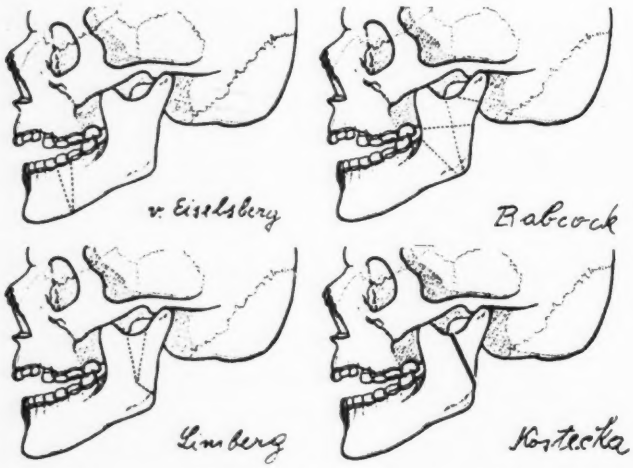


Fig. 4.—Diagram of various methods of surgical treatment of open-bite.

the teeth and defects of speech, and also have a very unpleasant facial appearance, the orthodontist should recommend surgical treatment in such cases where he can do nothing.

The cases of open-bite which are especially suitable for surgical treatment are, according to my experience, chiefly extensive open-bite, and open-bite com-

bined with protrusion of the mandible (Figs. 1, 2, and 3), and also extensive open-bite in which the angle of the mandible is flat or the maxilla is bent in a vertical direction.

Until now the surgical treatment of this defect has been used only in isolated cases, as can be seen from the literature, and the methods of operation differ considerably from each other. Hullihen, Eiselsberg, Pickerill, Lalich, Lane, Lindemann, Cohn-Stock, Mayrhofer, Blair, Ernst, Ley and Korth, all, as far as I could ascertain, operated on open-bite by a vertical cut through the

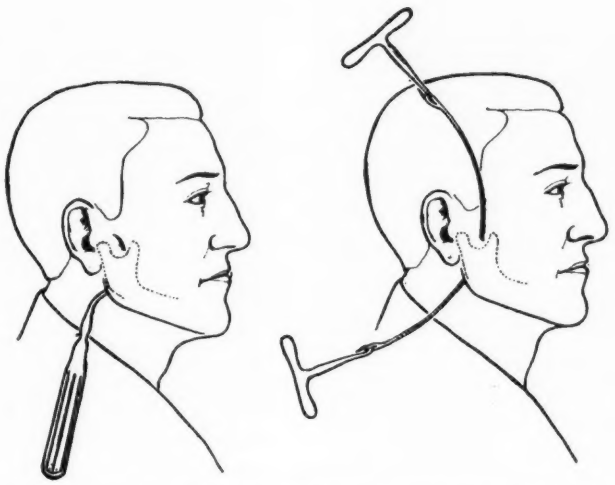


Fig. 5.—Insertion of the curved needle and the Gigli saw.

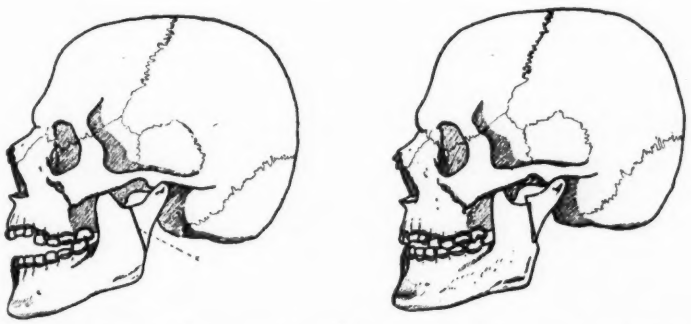


Fig. 6.—The cut of the mandibular ramus between the posterior edge and the center of the sigmoid notch; pushing the mandible up into normal occlusion after osteotomy.

mandible in the region of the canines, premolars or molars on both sides, and then pushed the medial portion of the mandible into normal occlusion.

On the other hand, Babcock and Limberg recommended a V-shaped excision in the mandibular ramus between the sigmoid notch and the angle of the jaw. Schmidt and Ivy corrected open-bite by horizontal osteotomy of the mandibular ramus. They all obtained remarkable results in advanced open-bite (Fig. 4).

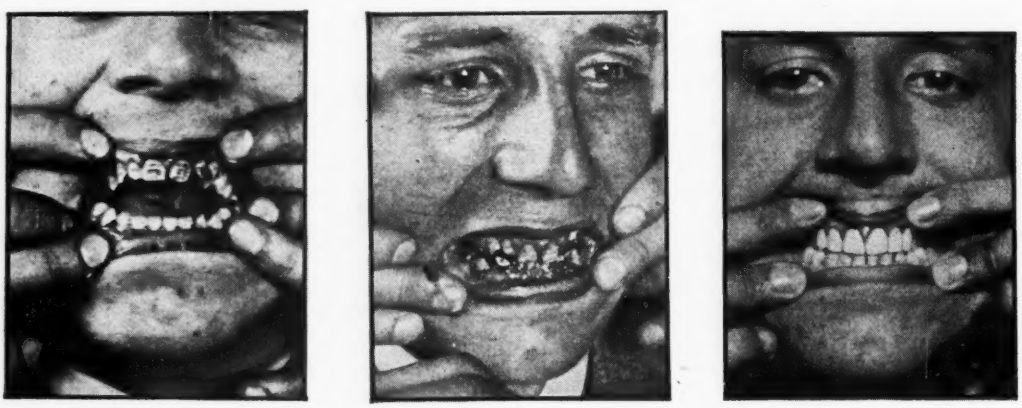
While studying the surgical methods mentioned above, I was convinced that they are too complicated and are attended by technical difficulties when cutting away the parts of the bone, and the vessels or nerves can be injured.

In these methods the operation involves long skin cuts, from which unsightly scars result. Being aware of the disadvantages of the previous methods and also that the patient only consents to plastic operation when the procedure is simple and safe and if he is certain that the functional and cosmetic results will be satisfactory, I have attempted to find a method which would answer all the requirements.

The method which I have used for five years in treating open-bite is as follows: The ramus of the mandible is cut through on both sides, between the posterior edge and the center of the sigmoid notch. (Fig. 5.) The cut is made

A. *B.*

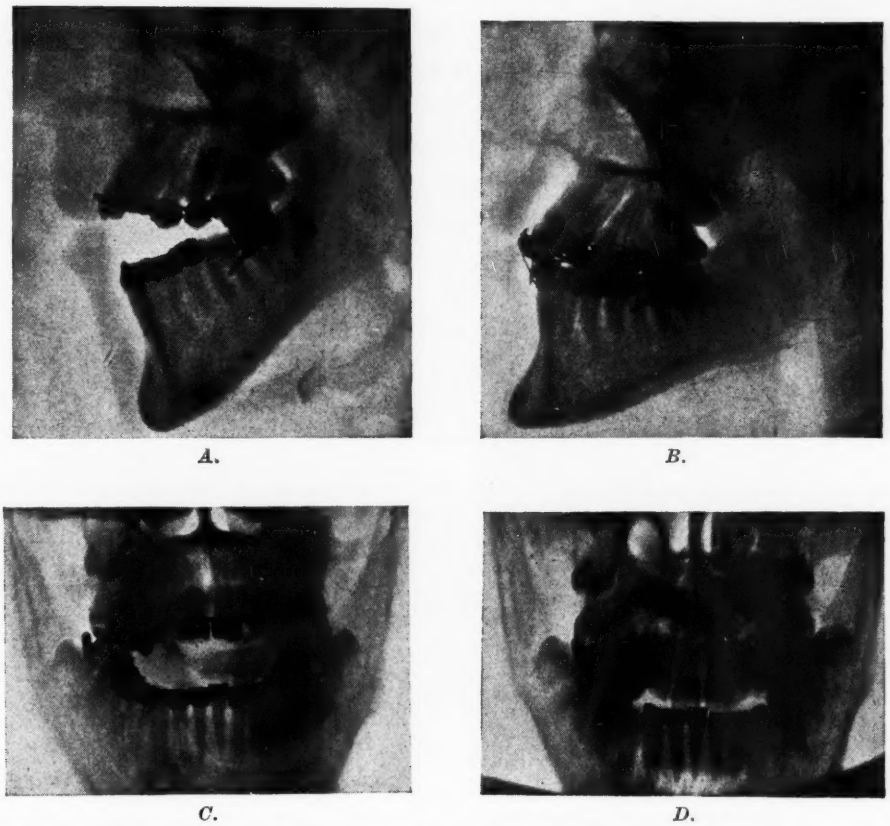
Fig. 7.—Photographs before operation and three months after operation.



A. *B.* *C.*

Fig. 8.—*A*, Nonocclusion before operation: *B*, normal occlusion three months after operation; *C*, correction of rachitic front teeth by jacket crowns.

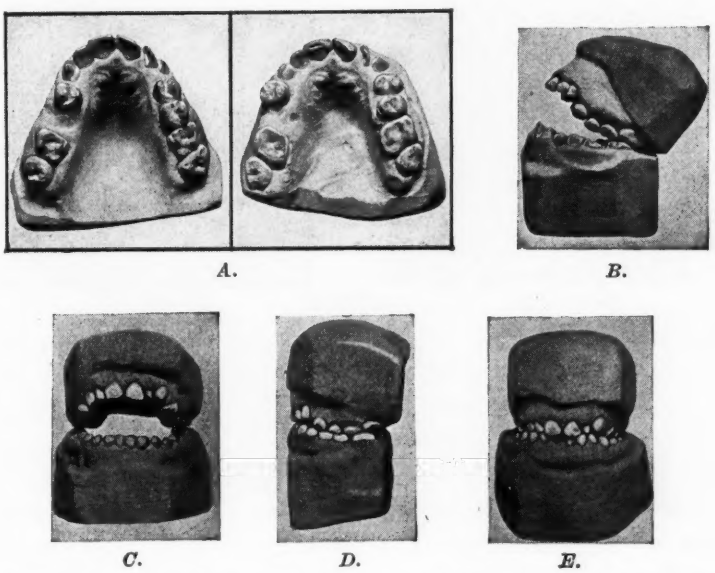
by means of a Gigli saw, which is introduced into the tissues by a strong curved needle. Its point is pushed in near the posterior edge of the mandibular ramus 2 cm. below the auricular point, and moves along the inner surface of the bone toward the center of the sigmoid notch, where it comes out again through the skin. After this procedure the Gigli saw is fastened to the point of the needle and is drawn back by the latter. The handles are then fastened to both ends of the Gigli saw, and the bone is cut through in a few movements. (Fig. 6.) When the jaw is cut through on both sides in this manner, it sinks down, as in the case of fracture of the condyloid process on both sides. I should like to mention here



A. *B.*

C. *D.*

Fig. 9.—*A* and *C*, x-ray pictures of open-bite; *B* and *D*, the same case after treatment.



A. *B.*

C. *D.* *E.*

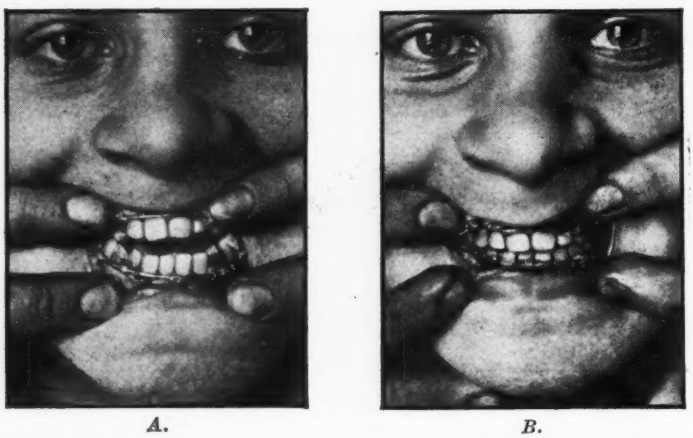
Fig. 10.—Showing narrowing of the maxilla in the region of the premolars before treatment; widened maxillary arch by orthodontic treatment; plaster models of open-bite before and after treatment.

that often great force must be used to push the mandible into its normal position after osteotomy has been performed. Both jaws are then fixed by a dental splint, until the cut edges of the ramus have united. This usually takes place in twelve weeks.

Three weeks later the wire splints are replaced by elastic bands. The patient can then open his mouth, but the bands continue to draw the mandible to the maxilla. Patients are advised to wear an orthodontic cap at night, to fix both jaws together.

A. *B.*

Fig. 11.—Photographs before operation and two months after.



A. *B.*

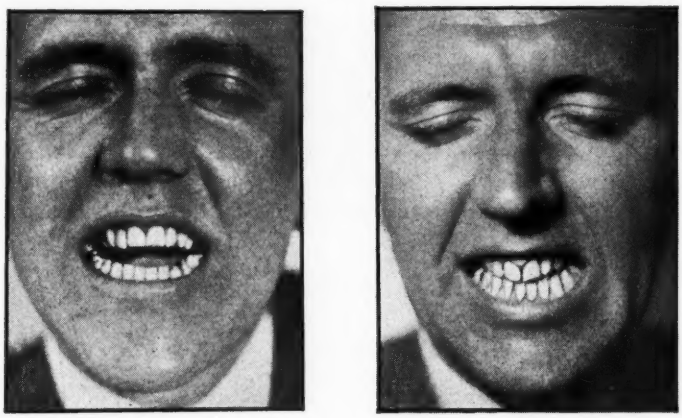
Fig. 12.—Open-bite combined with mandibular protrusion before operation and two months after.

CASE REPORTS

CASE 1.—P. J., eighteen years old. He had had rachitis and pertussis in childhood. Patient had an idiotic facial expression. When biting, only the second molars were in contact. The distance between the maxillary and the mandibular incisors when the jaws were closed was 2 cm. From the plaster models, we have proved that it is necessary first to widen the maxilla in the premolar region, and only then would it be possible to push the mandible into normal occlusion with the maxilla.

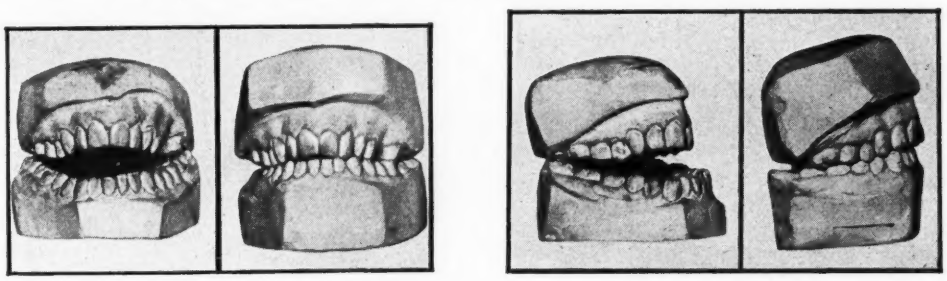
An orthodontic apparatus was placed, and the maxillary arch was widened. Then osteotomy was performed on both sides, according to the method already described. After three months the wire splints were removed, and the rachitic front teeth were covered with jacket crowns. According to the x-ray pictures and the photographs, the surgical result was satisfactory. (Figs. 7-10.)

CASE 2.—R. L., twenty-one years old. No unusual complications in childhood. The vertical distance between the front teeth was 1 cm. Besides the open-bite, there was also slight protrusion of the mandible. After osteotomy had been performed on both sides, it was possible to push the mandible into normal occlusion, as is shown in the photograph. (Figs. 11 and 12.)



A. *B.*

Fig. 13.—Open-bite before operation and three months after.

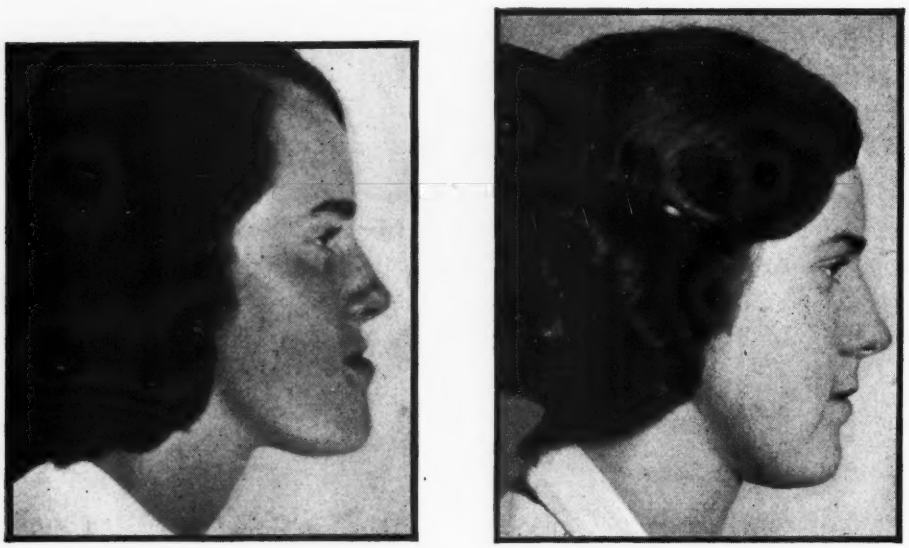


A. *B.*

Fig. 14.—Plaster models of open-bite before and after treatment.

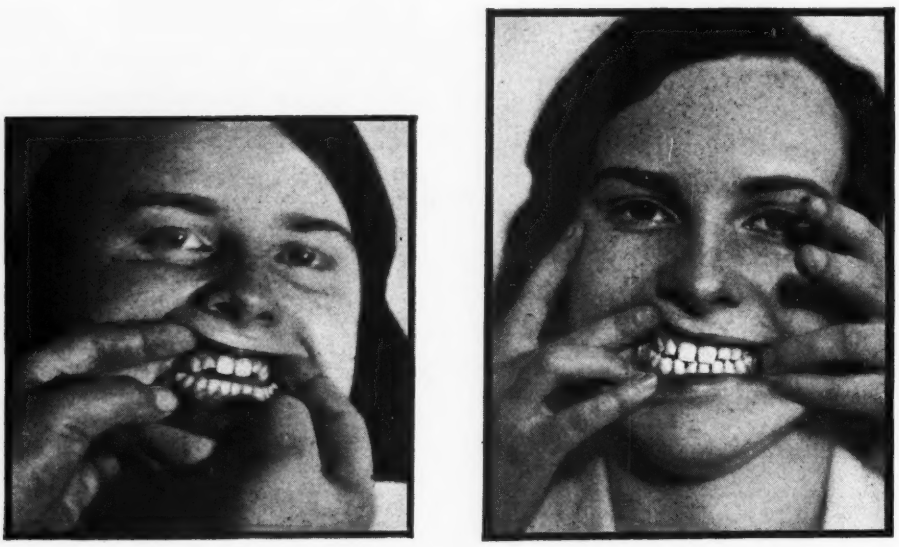
CASE 3.—S. K., twenty-four years old. Patient had had rachitis in childhood. Even the first molars were not in contact. The distance between the mandibular and front teeth was 1.3 cm. Open-bite was combined with slight mandibular protrusion. After oblique osteotomy had been performed on both sides, as in Cases 1 and 2, it was necessary to use a great deal of force to push the mandible into the correct position. The period for fixation was five months. The result, considering the extent of the anomaly, was quite satisfactory. (Figs. 13 and 14.)

CASE 4.—R. J., a schoolgirl, fifteen years old, had had rachitis in childhood. Before operating, it was necessary to make a slight orthodontic correction in the maxilla. After osteotomy had been performed, the jaw was immobilized for four



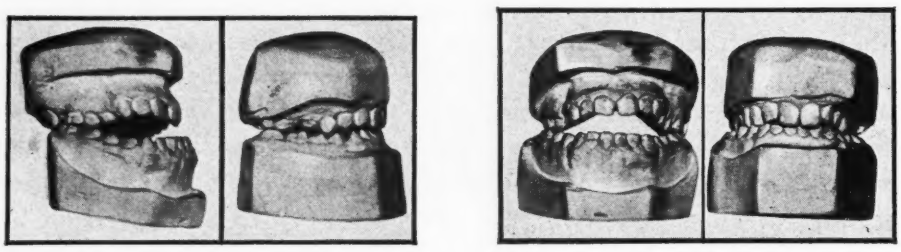
A. *B.*

Fig. 15.—Photographs before operation and three months after.



A. *B.*

Fig. 16.—Open-bite combined with mandibular protrusion before operation and three months after.



A. *B.*

Fig. 17.—Nonocclusion of the teeth before treatment and perfect correction after operation.

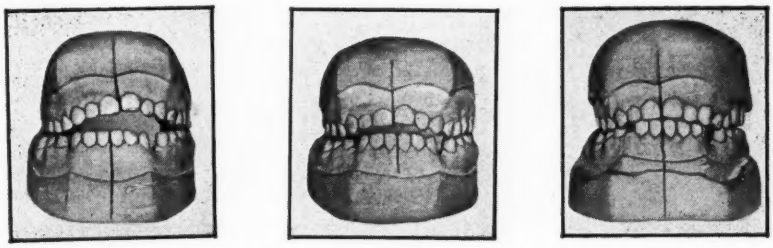
months, and then other small orthodontic corrections of the position of the maxillary left incisors were made. The result of this treatment can be judged from the photographs. (Figs. 15-17.)

A. *B.*

Fig. 18.—Photographs before operation and three months after.

A. *B.*

Fig. 19.—Open-bite combined with mandibular protrusion before operation and three months after.



A. *B.* *C.*

Fig. 20.—Plaster models before and after treatment.

Case 5.—K. G., twenty-four years old. No unusual complications in childhood. The mandible projected to the right side the width of one tooth. The vertical space between the maxillary and mandibular front teeth was 1.0 cm.

In this case, oblique osteotomy was performed in the ascending ramus on the left side, and then the mandible on the right side was chiseled out in the physiologic space between the canine and the first premolar. Chiseling was per-

formed intraorally, and was rendered easier by the extraction of the right canine. Quite normal occlusion was obtained after this operation. (Figs. 18-20.)

CONCLUSIONS

The advantage of this operation is its easy technic. It can be performed in a few minutes under local anesthesia. No incisions are made in the skin, and the needle punctures heal without leaving any traces. Any injury to the large vessels, nerves or musculature is quite impossible. The general appearance of the patient is thereby vastly improved.

I am, however, convinced that it is impossible to recommend only one method for the operation for open-bite, because the varieties of this anomaly are numerous. It is necessary to know the results obtained from all the methods which have been used up to now, in order that a method may be chosen which will have the best result for each individual case. It happens sometimes that the operator must modify one method or combine several methods during the operation.

This new method of operation, which has been in use since 1929, has many advantages not possessed by the older, more complicated methods, and I therefore believe that it can be recommended for cases similar to those here described.

A PLEA FOR A MORE SCIENTIFIC PROCEDURE IN PRESENTING OUR ORTHODONTIC PROBLEMS

BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK, N. Y.

MY ORIGINAL intent was to present the evolutionary steps in the development of the orthodontic appliance. Instead I am taking the liberty of presenting something of a more practical nature, and at the same time more applicable to our present-day needs. I believe it will be far better to dwell upon a phase of orthodontic procedure that has been neglected altogether too long.

Scientific research may be conveniently divided into two classes: one in which the motive is solely the desire to extend the boundaries of knowledge, and the other the special purpose of which is to obtain results which will have a direct bearing upon problems we are concerned with. Scientific investigations carried on with the single motive of acquiring new knowledge often lead to results of great practical value. Such applications are, however, only incidental, and in the world of science they provide no test of the importance of the work done.

I have hesitated to present this study, for I realize it is only in the experimental stage and still requires more work. Yet I do not feel that I am justified in longer withholding something that might be of interest and of value to my fellow-orthodontists.

Most of you, no doubt, have arrived at the conclusion that the historical phase of our science is my only concern, and that my early interest in orthodontic problems has been entirely sidetracked. However, for the past four years I have been quietly working upon the problem I now want to present.

What happens, in an orthodontic office, when a mother first brings her child to the orthodontist for an opinion, examination, consultation, or whatever she might term it?

There are several methods of procedure. One is to place the child in the dental chair, obtain a case history, then open the child's mouth and examine the number of teeth present, determine immediately the class of case under consideration, state that it can and should be immediately corrected, the time it will take and the cost. The mother, however, is primarily interested in only the latter. A second method is to examine the mouth, take impressions and x-ray pictures, hurriedly examine these, come to a quick decision based upon previous experience, and spend more time in looking up in Dun's and Bradstreet's the financial report of what the father is able to pay and whether he can keep up with his obligations, etc. At the next visit he renders his report. Can anything be more unscientific than

Presented at a meeting of the Eastern Association of Graduates of the Angle School of Orthodontists.

proceeding upon these lines, and is it any wonder that the laity has little respect for orthodontic procedure and opinion? No wonder they have considered the "price" the important item and are in the habit of going from one orthodontist to another for advice and the cheapest service.

In the first group, if the work is undertaken, we then make models and roentgenograms, study the case, see what we have to contend with and begin to put on bands. Our case then begins to unfold itself. If in the second group, though, we have the models and the films which are usually a series of infraoral, our hastily drawn conclusions give no idea of the case under contemplation.

About five years ago I suddenly had a jolt that showed how unscientific my previous procedure had been, and I then began to realize that it was time to change my antiquated methods. A child of twelve years was to begin orthodontic treatment, the time and fee being satisfactory to the mother. On the left side I found that the premolars had already fully erupted, and according to my previous experience, the right mandibular molars should erupt within the near future. Imagine my surprise, upon then studying the extraoral films, to find the germs of the canine and premolars to be in a stage of new formation and that at least three years would be required for these to erupt and take their place. I was to finish the case within two years, but the permanent teeth could not assume their logical position for still another year. One will say this is an unusual problem, but should we not know these problems before we give *any* opinion? To make matters worse, the two maxillary permanent lateral incisors were not in place, while the deciduous one had been lost about five years previously.

In looking at the mouth one would come to the conclusion that they were missing or unerupted or would be peg-shaped if they did come through, and we then would hope, by the "grace of God," that they were merely late in taking their proper position. When I examined the occlusal film, I had another shock, and found that one was missing and the other one was just off the median suture on a line with the third molars, again something out of the ordinary; but I should have known all these facts in the first place.

Today my procedure is not to give any opinion, advice, etc., at the first visit, but to obtain a detailed history, for reasons I need not discuss before this group. Then impressions and three extraoral and occlusal roentgenograms are made. When these are finished, I then proceed along the lines I shall describe a little later.

At the time that I realized the unscientific method of my procedure, I looked around for a means to present my facts in some scientific manner. I considered the Bonwill diagrams, the Hawley charts, Stanton's engineering plan and others, and found something lacking in each. It was then necessary to obtain something different than was at our disposal.

For months I measured a hundred of my cases, for size of teeth, shape of arches, etc., making some dozens of charts. I finally "hit" upon one arch form that took in over 80 per cent of my cases. I am frank to confess the weakness of my present procedure. One form will not do, and many more should be designed. Yet for the presentation of an opinion it answers ideally. It is this

point also that made me hesitate to present this subject. Still it is better than anything I now know of. For the side views it was essential to have three charts, a deciduous, a mixed and a permanent dentition.

Another stumbling-block, after I had the charts, was to use them correctly. There was no satisfactory method to record the exact position of the teeth upon the charts. I experimented by making any number of mechanical forms that would transfer these positions; I tried a number of artist's contraptions, etc., but with little success. Stanton's machine was too complicated and took too much time to record each line, especially as this was but a preliminary step before actually having the orthodontic case.

I then thought of the baliopticon and found by that time that the Spencer Lens Co. had just brought out the orthodontic delineascope. This I then tried but found it, at that stage, not entirely fitted for my use. They were kind enough to make certain changes, added an iris, and I have since made other changes myself.

It now takes but fifteen minutes to obtain an accurate outline of the occlusal views and to chart them. The side views require much more time and care.

In order to do this I have had first to make an illuminating box which measures $9 \times 12 \times 2\frac{1}{2}$ and in front a shield to cut off the ordinary daylight. It is now a comparatively simple thing to prepare the side views.

It was then necessary to prepare another chart to show the occlusal position of the maxillary and mandibular teeth, as well as the anterior teeth.

METHOD OF PREPARING CHARTS

By the use of the orthodontiascope, the correct outlines of the present arch form are recorded. The blue outline of the "average number of arch forms" clearly indicates the position the teeth should assume, and a study of the two will give some idea of direction and movement required.

The chart form selected depends upon whether there is a deciduous, mixed, or permanent dentition.

By studying the films one can ascertain whether all the teeth are present, whether some are missing, or whether supernumeraries are involved.

By placing a copy of the permanent dentition chart under the one that is being worked upon, on the illuminating box, it is simple to record the position of all the teeth. If a Class II or III case is under consideration, the outlines of the teeth are so recorded. The overbite is shown on the anterior teeth and occlusal chart. By use of the illuminating box these outlines are easily copied again on the above mentioned chart.

Various colored pencils are used to simplify the reading. For the permanent teeth I use yellow, and for the deciduous I use green.

These same charts can be used for a study of the progress of each case, as repeated impressions can be taken and recorded in different colored pencils.

I have been surprised, upon checking up my old "finished" cases, to see how near I came to my "average chart form" and was indeed happy to

find the high percentage that fell into this form and reached the average. It is for that reason that I believe the form worked out is an "ideal" form.

After these charts are prepared, on the opposite page are recorded the findings, treatment, etc. Later, if some point comes up in a discussion between parent and operator, by referring to the original opinion, little more is heard of the question.

There is considerably more work required before this study is satisfactory and perfect, but I believe we have here a means of presenting our work in a more scientific fashion, and it has certainly proved that an opinion thus given is comprehensive and well received.

DEPARTMENT OF
DENTISTRY FOR CHILDREN

A BRIEF REVIEW OF THE GROWTH OF THE JAWS*

C. EDWARD MARTINEK, D.D.S., DETROIT, MICH.

MAN has been very prolific over the years in amending the literature on the growth of the jaws. So sufficient is that as proof of the complexity of the subject that I must preface this brief résumé with the reminder that my paper is of necessity only an outline.

At birth, all the deciduous teeth are present and almost completely calcified, though usually unerupted. The first permanent molars are partially formed, and the follicles of the rest of the permanent teeth, save the second and third molars, are present and growing. The maxilla, with its alveolar processes just beginning to form, is quite flat. In the mandible the ramus forms no angle with the body of the bone, it being, from the coronoid process to the symphysis, practically a straight member. Such is the picture from birth until the central incisors erupt.

During that period cementum is added to the deciduous teeth to form the roots. The central incisors, in this respect, are in advance of the rest of the teeth. As the roots become longer, the crowns, assisted probably by the pressure of the blood, are pushed occlusally. They thus make their way through the hard bones of the jaws. Concurrently, new bone is being deposited about the teeth, forming the alveolar processes.

By the time the central incisors erupt, there has been some alveolar bone formed. Moreover, a bend has developed in the mandible just distal to the second premolar teeth. Thus, the ramus becomes a more distinct part of the bone. The angle it forms with the body of the mandible seldom becomes as small as a right angle. It is, however, reduced as the alveoli are laid down and the crowns of the teeth come through the bone.

The bones of the jaws do not come to their final proportions through a steady even term of growth. Instead, they grow in spurts that have a very definite relationship to the eruption of the teeth. The question of just exactly where bone is added to the growing jaws of a child has been the subject of debate for many decades. As a result of the controversy some extremely interesting and ingenious experiments have been conducted. One of these told by Arthur Kieth in *Menders of the Maimed* is appropriate to this paper.

Back in 1736 a calico printer in London invited a young surgeon to supper. He placed before the surgeon a joint of pork. The guest noticed that the bones of his portion had a reddish color. Questioning his host, he learned that the

*From the Section on Children's Dentistry of the Detroit Clinic Club.

printer raised his own pigs, which he fed mostly on madder, an herb used in making red dye. His curiosity aroused, the doctor experimented to see if he had thus accidentally encountered a stain that might be used in the laboratory study of animals. He found that, of all the tissues in the body, madder-feeding stained only the bones. Further, he discovered that it stained only that bone which was formed while the animal was on the madder diet. By feeding the herb to a growing subject, in periods separated by other diets, he was able to produce alternate regions of red color on the bones. His published results attracted John Hunter, who decided to use the madder in an effort to ascertain just where new bone was deposited in growing tissue. Hunter's conclusions pertaining to the mandible were these: "*The jaw still increases in all points until twelve months after birth when the bodies of all the six teeth are formed, but it never afterward increased in length between the symphysis and the sixth tooth; and from this time too the alveolar process which makes the anterior part of the arches of both jaws never becomes a section of a larger circle.* After this time the jaws lengthen only their posterior ends, so that the sixth tooth which was under the coronoid process in the lower jaw and in the tubercle of the upper jaw in the fetus is at last, viz., in the eighth or ninth year, placed between these parts." By the word "between" I understand him as meaning "ahead of" these parts. In the main, Hunter's conclusions were correct, for by far the greater part of the increase does occur at the posterior ends of the jaws. However, it appears that the anterior parts of the arches do undergo some change after the first year.

From the time the last deciduous tooth erupts until just previous to the eruption of the first permanent molar, there is comparatively little increase in the length of the jaws. During the time of this eruption the space between the anterior border of the ramus and the distal surface of the second premolar grows larger by an absorption of bone in the anterior substance of the ramus near the angle. Concurrently, bone is being deposited on the posterior border of the ramus. A similar posterior growth occurs in the maxillae. The jaws are thus pushed a little farther forward into space. After a short period, in which little growth can be observed in the anteroposterior direction, the process is repeated, and the second molar comes in to close the interval. Likewise, a posterior growth takes place in the maxillae. As before, there is, henceforth, little growth until prior to eruption of the third molars, when the procedure is again performed. All this growth has occurred posteriorly to the sites of the last deciduous teeth and accounts for most of the increase in length of the jaws. However, in the meanwhile there has been growth to a lesser degree in the more anterior regions of the jaws.

As the follicles for the permanent incisor teeth become larger, they finally arrive at dimensions beyond which further growth imparts an internal pressure against the surrounding bony encasement. As a result of this, there is growth of the anterior jaw segments. The so-called developmental spaces between deciduous incisor teeth are the presumed evidences of this and would, therefore, be formed by the time all the deciduous teeth have erupted. Any time following the third or fourth year, the developing and erupting permanent canines usually provide impetus for intercanine expansion of the arches. These two items of

growth make the major compensation for the greater space required by the permanent anterior teeth than that demanded by their predecessors. The balance of the space is gained when the wide deciduous premolars are replaced by the narrower premolars.

It is quite obvious that the combined diameters of the six most anterior permanent teeth are ordinarily considerably greater than the combined diameters of the deciduous teeth they replaced. It is doubtful that the expansion of the arches in that region is matched by the disparity between the combined diameters of the deciduous premolars and the total diameters of the smaller permanent premolars. Thus, there is some change in the distance between the symphysis and the sixth tooth; and the arc formed by the alveolar processes does become the arc of a large circle.

We have so far considered the length changes in the jaws, and the increased height of the mandible and the maxilla as the alveolar processes are formed. These bones increase in thickness, too, during the years, in response to the functional activity of these organs. The agents producing growth, like the course of growth itself, have long been under dispute.

Until the time of Goodsir, orthopedists were divided into two schools of thought on the questions of the source of osteogenetic power. One held that the periosteum alone possessed the ability to grow bone; the other, that all powers of osteogenesis were the peculiar property of the blood. In the middle of the nineteenth century a third school relegated this phenomenon to the bone itself.

In about 1841 John Goodsir examined dissected bones under a microscope; he was one of the first to do this. In every type of ossification which he investigated there was one type of cell common to all. These cells he traced within the bone, detected them in the haversian canals, and saw them finally become completely embedded in bone. He was the first to describe the true bone-forming cells, the osteoblasts. His observations convinced him that the bone, and not either the periosteum or the blood, could build and destroy osseous tissue.

Now, after almost two hundred years, we still have these three schools of thought. In the meanwhile, men have come to place less credulity in the blood theory of osteogenesis. During the same period additional strength has been added by Sir William Macewen to establish the validity of the claim that bone possesses the power to reproduce itself. This worker, in the opinion of Sir Arthur Kieth, is justified in attaching great importance to the bone theory, but is unjust in his lack of regard of the periosteum. "Periosteum can reproduce bone," says Kieth, "for no one yet has made a microscopical examination of the periosteum of growing or of inflamed bone and failed to find in it those very elements which Macewen admits to be the creators of bone-osteoblasts. From an anatomical, and I think also from a surgical, point of view, the osteogenetic power of the deepest stratum of the periosteum cannot be denied."

In jaws, the influences that excite the osteoblasts to their great work are many. Stephen A. Moore quotes Noyes as saying: "In all the process of development the growth is the result of all forces to which the bones are subject, perfectly distributed through the substance of the bone by the agency of nor-

mal occlusion.'' Dr. Moore defines the forces of normal occlusion as those factors which, when acting normally, cause teeth to assume and maintain their normal positions in the line of occlusion. He groups these forces as follows: (1) normal cell metabolism, (2) muscular pressure, (3) forces of the incline planes, (4) harmony in the size of the arches, (5) normal proximal contact, and (6) atmospheric pressure.

In view of the foregoing, we may say that jaws increase in length largely by the addition of bone to their posterior extremities. To a smaller degree, growth occurs anteriorly to the first permanent molars as the crowns of the permanent teeth grow to full size, as the tongue pushes the erupting teeth into place, and as the permanent canines force their way through the bone substance. Further, we may say that the deposition of alveolar bone accounts for the greatest portion of vertical jaw growth. We may conclude, too, that the production of osseous tissue is accomplished by highly specialized cells, the osteoblasts. It is likely that osteoblasts are created by both the bone itself and the periosteum. Finally, we may consider that normal growth depends upon many stimuli, some local to the mouth, others general to the entire organism; but all are interdependent one upon the other. These stimuli are free to act within limits predestined by heredity more than they are restricted by that questionable property of bone to grow in response to a need for it.

CALCIUM ACTIVATORS*

Cod Liver Oil, Viosterol and Haliver Oil

Mark A. Gardner, Jr., D.D.S., Detroit, Mich.

THIS is a subject about which a great deal has been discussed and written, both pro and con.

The calcium activators lead us to the subject of calcium metabolism, which is the most important function of the calcium activators.

In the human being calcium is found in practically every cell of the body. In the blood there are from 9 to 11 mg. of calcium per 100 c.c. This blood calcium is primarily found in serum; there is practically none in the corpuscles.

Absorption of calcium is governed mainly by three factors:

1. Calcium is absorbed from the small intestine.

2. Absorption of calcium is dependent upon the presence of other substances in the diet. Excessive fat tends to inhibit absorption of calcium by the formation of insoluble calcium soaps with fatty acids.

3. Vitamin D is one of the most important of the calcium activators, and is most essential to normal calcium metabolism. Vitamin D is a fat soluble substance and a derivative of cholesterol, namely ergosterol. Hess believes not only that vitamin D aids absorption but also that its main activity is exerted in the intermediary metabolism processes.

The intake of calcium must equal the daily requirements to keep the output balanced.

Rickets is a disease due to deficiency of vitamin D. It is a disease of the first and second years of life and rarely begins before the sixth month. Late rickets may appear between the ninth and twelfth years, or later. The general clinical symptoms are delayed dentition, delayed walking, general soreness of the body, and profuse sweating about the head.

Vitamin D is essentially an antirachitic element and acts more during the period of tooth formation than at any other time. Vitamin D aids absorption and deposition of calcium in the osseous tissue and tends to bring about a complete balance.

Vitamin D is abundant in cod liver oil, viosterol, eggs and butter, and is manufactured prodigiously under the influence of ultraviolet rays.

The antirachitic action of various irradiated foods and calcium substances is determined in the clinical laboratory and in the clinics throughout the country, and a great deal has been done on this work.

Cholesterol could be activated readily by mercury vapor lamps, and there are many opinions as to the antirachitic efficiency of irradiated cholesterol.

*From the Section on Dentistry for Children, Detroit Clinic Club.

Hess found that activated ergosterol is about 500 times as potent as irradiated cholesterol. A pint and a half of milk daily contains sufficient vitamin D for normal calcification.

As we found the great advantage of this valuable fat soluble vitamin D, let us consider the artificial and manufactured products that are standardized and contain vitamin D.

Cod liver oil is remarkably rich in two vitamins known as A and D. A rather wide range of vitamin potency is found in various brands of cod liver oil.

Dental caries, in which we are extremely interested, is entirely too common, and its cause may lie much deeper than the daily care of the teeth. Soundness of the teeth, in a measure, depends upon the amount of vitamin D in the blood and lymph, and this vitamin if not contributed by the diet must be obtained in some other way. A sure source is cod liver oil of a standard brand. The dosage is based on a prophylaxis standard. Infants are given from 8 to 10 drops daily dosage, increased according to age, from 1 to 3 teaspoons daily.

ERGOSTEROL, VIOSTEROL AND CHOLESTEROL

Ergosterol is a chemically pure substance which the French chemist, Tannet, first separated in a crude form from the fat of rye ergot in 1889. Later, in 1908, he succeeded in getting out the pure crystalline body. This sterol is present in small amounts in fats. It is richest in the fat of ergot and yeast, and is present to a lesser degree in the crude oil from cottonseed, peanut and corn, and a slight amount is found in mushroom, cereal grains, animal tissue, liver and egg yolk.

The unique feature about this sterol is that it appears to be the only one of many present. These fats have the property, when irradiated by certain bands of the ultraviolet spectrum, of changing their chemical constitution and acquiring an entirely new physiologic property. Thus, before exposure to the ultraviolet light, pure ergosterol is absolutely inert, so far as the prevention of rickets is concerned. Ergosterol must be diluted with oil, and viosterol is the trade name of ergosterol.

Viosterol has been adopted as the trade name by the Council on Pharmacy and Chemistry of the American Medical Association to designate irradiated ergosterol. Viosterol is a solution in oil of ergosterol which has been previously subjected, under exact conditions for its influence, to the ultraviolet light from a quartz mercury arc lamp.

Viosterol has been so adjusted and standardized by animal tests that it carries a vitamin D potency equal to the Steenbock standard, which is approximately 250 times that of cod liver oil. The substance does not contain vitamin A, and for that reason cod liver oil preparations are ordinarily preferable for prophylactic purposes. In early tooth decay in rapidly growing children the teeth are liable to be sacrificed to the skeletal development. Early tooth decay suggests the need of vitamin D, the most concentrated and acceptable form of which is viosterol, and the dose should be governed by the age of the patient. The dose most recommended is from 8 to 10 drops daily, and for the rapidly growing infant 15 drops daily.

Cholesterol.—Zucher has previously shown that the antirachitic property of cod liver oil resides in the nonsaponifiable portion of fat. Both Steenbock and Hess observed that the substances rendered antirachitic by the ultraviolet light resided in the fat portion of the food, and in the nonsaponifiable fraction which contains the cholesterol of animal tissues. This suggested to them that cholesterol was the basic constituent or provitamin D. Cholesterol by changes of the ultraviolet light is variable, that is, by absorption of the ultraviolet light so that ergosterol is the basis or "mother substance" and not cholesterol.

The ultraviolet ray is not really the basis of all these products.

Haliver oil is taken from the halibut liver and has a potency of 50,000 units per mg. of vitamin A. These substances were formerly used empirically in the prevention or cure of deficiency diseases due to the lack of these vitamins. Haliver oil has a high potency of vitamin A; and combined with viosterol with its high vitamin D content, these two adequately supply both A and D. It is so potent that only 8 to 10 drops daily are prescribed for growing infants, and not more than 20 drops daily, at the most.

Some of the leading research men say that calcium deficiency can and should be eliminated by a diet adequate for normal maintenance and development of the teeth which may be planned by any one. The services of a dietitian are not required, nor is there any need for the use of the proprietary preparations of the food faddist. All the necessary foods can be bought at the grocery store except cod liver oil, haliver oil or viosterol, which may be necessary under special conditions when the individual cannot or will not take a sufficient amount of ordinary food.

The principles of adequate diet are: 1½ pints milk, 2 oz. butter, 2 eggs daily, 2 green vegetables daily, fruit including oranges.

The calcium activators are recommended for use with reservation. They should be used extensively in the months between November and May. Haliver oil with viosterol may be used at all times to keep the diet normal.

A new product on the market is irradiated vitamin D milk.

PULPITIS

W. W. Warriner, D.D.S., Glendale, Calif.

I SHALL attempt to describe a few clinical manifestations of pulpitis from careful observation over seventeen years. Formerly I considered pulpitis to be merely a toothache, but now I regard it as a very serious infection. Now when a patient says he has "just a little toothache," I expect upon excavating to find anything from a drop of blood or pus to a vent of foul odor.

I first noticed while removing caries or changing treatments that often the patient becomes ill, sometimes vomits, and usually becomes weak and faint. This I first regarded as psychic syncope, but I now believe it to be toxic. How severe this toxic condition becomes depends upon the type of infection, the amount of infection entering the circulation, and the patient's immunity to the specific type of organism. The results, however, from possible metastasis to other parts of the body occurring as secondary infections, such as stomach ulcers, acute appendicitis, thrombosis, and phlebitis, are more dangerous.

The first case to arouse my interest was that of a patient with acute pulpitis who failed to keep the successive appointment. Upon inquiry, I learned that he had immediately developed an attack of acute appendicitis and the appendix had been removed.

This has occurred in several instances, and now when I have a patient with pulpitis, I inquire as to whether or not he has been very sick or has been operated upon recently. One patient informed me that after the tooth had ached acutely he had had a severe attack of ptomaine poisoning. He had been in a forestry survey party when this occurred. When questioned further he said that none of the rest of the party were ill even though they all had eaten of the same food supply. Since this occurred only a few days after the tooth had ached, I concluded that it had not been ptomaine poisoning

The practice of capping pulps at times has great consequences. An x-ray examination may aid in determining some of the possibilities of the recovery of the pulp from acute pulpitis. If the roentgenogram shows plainly that the apices of the roots are open wide and have the blunderbus shape, even roots with a direct exposure and considerable hemorrhage may be successfully capped. But as the roots begin to show a more complete growth, the chances of death to the pulp are greater; when the root becomes a very fine pulp canal, even the slightest amount of infection and toxin passing through the tubuli of the dentin may cause enough irritation and congestion to strangulate the pulp. This may progress slowly. Most cases seem to take from six months to a year, and I have seen one case that took seven years if the patient was correct about the time of filling.

Trauma very often causes pulpitis. Bruised or broken anterior teeth present the problem of whether to enter the pulp chamber immediately or to await development. The roentgenogram may aid in showing the width of the canal or the possibility of a broken root. Most of the cases I have observed have taken about one year to abscess. Years later a comparative x-ray examination may show whether the root has grown normally or whether it has stopped growing and shows signs of abscessing.

Trauma of the deciduous central incisor developed in my youngest son, and I had the opportunity to observe it carefully. He bruised the tooth at the age of five years. It darkened slightly but apparently was not infected until he contracted a cold about six months after the injury. The child had a slight fever in the afternoons, and he had very little endurance. He would try to play but in a few minutes would be lying quietly some place just resting. After about three weeks his gums swelled slightly. I extracted the tooth, and in from three days to a week the boy had recovered normal endurance.

In many cases of trauma in adults rarified areas continue to show about the roots, and there is slight tenderness years after the root canals have been apparently well filled. This is possibly due to the peridental injury.

I feel sure that some time we shall know more about the cardinal symptoms of pulpitis, but right now there are a few things that can be noted in observing pulpitis which may sometimes lead to a proper diagnosis. The pulps of deciduous teeth and of newly erupted permanent teeth are not so sensitive to thermal change as are those of the completed permanent teeth, so they cannot be regarded alike. Cold or heat seldom registers pain as the cavity deepens, but acids forming in the caries and certain other chemicals may irritate, especially if the tubuli are quite large or extremely sensitive. Nearly all such cavities may be properly cleansed and filled, with uneventful reaction to the pulp. If, however, the pulp has ached for at least five minutes continuously, occurring especially upon retiring or arising, the prognosis is possible trouble, with few exceptions, viz., if the roentgenogram shows that the roots are incomplete and have blunderbus-shaped canals, providing adequate circulation for repair of the injury. In this case exposed pulps have been successfully capped or amputated.

The success of capping the pulp and protecting near exposure depends greatly on the youth of the tooth.

We should be the first, next to the patient, to recognize our failures and to rectify them before too much damage is done. In order to do this it is necessary to have a thorough and complete understanding with the patient as to what we are attempting to do, and the consequences or at least part of the series of events which he may expect in the event of failure, which, I believe, is inevitable in some cases in which the prognosis has been good.

For instance, a patient with a very sensitive cavity gave a history of only a little pain occurring at night and lasting about five minutes, seemingly caused by food fermenting. Finding that cold water irritated and that warm water relieved, and that vacuum suction or pressure of cementing did not hurt, a metallic restoration was made and the patient was dismissed. A nota-

tion was made on her chart that the tooth had ached at night. My assistant met her several months later, and the patient mentioned having interviewed her physician about neuritis in her jaw and face following a cold. She was very much discouraged because the pain had become so severe that she could not raise her arm to comb her hair or to write on the blackboard in school, and she said emphatically that something had to be done.

Immediately I recalled a very similar case in which a patient had been treated by a physician for six months with no improvement. In both the cases neuritis had extended to the back. In one case it had become very difficult for the patient to take a deep breath. My complete success in the previous case led me to examine the record of the latter patient, and I had my assistant arrange an appointment. I removed the filling, and treated the tooth by removing the pulp and filling the canals. In a few days the neuritis had improved, and in a few weeks had disappeared entirely and has not returned. The first case occurred more than ten years ago, and the second about four years ago. Today I should be tempted to extract a similar tooth.

Tapping the teeth very lightly will obviously disclose the apical condition, but in order to differentiate between the more acute stages of pulpitis it is necessary to employ cold, heat, and electricity. Extreme cold or ice may single out a hopeful case; but if extreme heat, such as smoking-hot gutta-percha applied to the enamel or filling causes pain, it is doubtful that the pulp can be saved.

After cold has affected a tooth for days, and then the tooth gradually reaches the place where cold no longer affects it and heat begins to irritate, it is almost hopelessly congested and is the next thing to an alveolar abscess. By this time the patient may be almost immune to the infection, as there is seldom the shock reaction to the system that occurs in the acute stage. However, the constant drain and lowered vitality are extremely marked in children and young people.

One boy about ten years of age had been studying dancing for several years and making wonderful progress. His mother informed me that he had recently been requested by a physican to give it up because of lowered vitality and poor heart action. It surprised me, knowing the boy's success and his mother's disappointment. I consulted his chart and learned that I had not seen the boy for two years. An appointment was arranged and the mother informed me that he had complained about his tooth months previously and she had intended to bring him in as soon as he was better. My examination revealed a deep cavity in a permanent first molar with putrescent pulp. I recommended extraction. Within a few months the heart was normal again.

In closing I wish to stress the fact that if there is shock, or syncope, or vomiting, there is infection, however slight the history of pain may be. This may help you to determine the advisability of capping or cementing, for many of our failures are in cases where the infection reaches the pulp through the tubuli long before the presence of the infection is determined.

I am now working on a blood analysis by which we may determine somewhat the intensity of the infection before it is clinically determined. However,

if stomatitis, extreme gingivitis, or Vincent's infection is present in the mouth, it is logical to assume that there is already some dyscrasia, and we may consider it the best of practice to open the pulp chamber immediately for drainage, for a few days even though we expect to extract the tooth. This would seem to me the proper procedure to prevent some of the major tragedies following extraction.

SAVING YOUNG AMERICA'S TEETH*

CHARLES A. SWEET, D.D.S., F.A.C.D., OAKLAND, CALIF.

IT IS my privilege to discuss with you for the next few minutes not only how we may save young America's teeth but why we should save them.

In the past twenty years we are told that the medical profession by preventive measures has been able to increase the span of life by ten years. The medical profession has brought us such preventive measures as vaccination, diphtheria toxin antitoxin, tuberculosis preventorium, and many others that have been the first step in conserving human life and in increasing happiness.

The statement has been made that the next step in preventive medicine is coming from the dental profession, and, if you will make this excursion with me through the mouths of America's children, I feel sure you will readily understand that the second step in prolonging life and adding happiness is in the realm of the oral cavity, the portal of entry, or gateway, to the human body.

Most of us think of a cavity as a hole in a tooth that is taken care of because the child may have a sleepless night and cause us as parents some discomfort. This is not the only reason for having a cavity filled, for in a cavity there is not a disease producing bacteria that one can name that cannot be dug out of this cavity and grown in sufficient numbers to kill a vast army. A cavity in a tooth is a point of infection.

May I tell you about a piece of experimentation that was carried on in 1928 in San Quentin Prison in California under the direction of the Carnegie Foundation. For a period of one week a group of prisoners were fed through a stomach tube so that no food could come in contact with their mouths. Everything which they had for one week, such as coffee, tea, milk and all foods, was given to them through a stomach tube. They were not allowed to use a toothbrush, a dentifrice, or a mouth wash. Nothing was allowed to touch their mouths for this entire period of one week.

At the end of this week a little bit of material was scraped from their mouths, equivalent in size to a piece of tissue paper one-eighth inch by one-eighth inch, that we call a cubic milligram. This cubic milligram of material was placed under the microscope so that the number of bacteria could then be counted in this small bit of material. The bacterial count was 8 million bacteria per cubic milligram.

The following week the prisoners were allowed to eat the ordinary prison fare and to drink whatever they desired, but no toothbrush, dentifrice, or mouth wash was allowed to be used. After living this way for the period of the next week, this same little bit of material, a cubic milligram, was taken from their mouths, placed under the microscope, and the bacterial count had dropped from

*A radio talk.

8 million to 8 hundred thousand bacteria per cubic milligram. Food itself is a cleansing agent especially when prepared in such a way that it offers chewing resistance.

The following week this same group of prisoners ate the ordinary prison fare and were allowed to use a toothbrush, dentifrice, and mouth wash, those adjuncts to mouth cleanliness, and to have proper dental attention by the dentists at the prison. Again this little bit of material, a cubic milligram, was taken from their mouths and, when placed under the microscope, showed a bacterial count of only 80 thousand.

I might spend my full allotted time speaking about the abscessed tooth or the tooth that has a dead nerve, properly known as pulp, in it that has not been cared for correctly. These teeth are discharging their poisons directly into the blood stream or indirectly in some other way and are making it necessary for young America's bodies to withstand this continual source of infection.

I hope that now you have the picture of the mouths of the children of America in a greater or less degree. When we take the very best foods, prepared in the very best of ways, and this food is prepared ready to be received by the stomach in the mouth that I have tried to portray to you, it is not as clean as if that same food had been dropped in one of our main highways, for on that highway there are fresh air, sunshine, snow and rain that cleanse the highway.

The White House Conference informed us that 25 per cent of the children in the United States are defective. If we were to take into consideration mouth defects such as I have mentioned to you, the percentage would mount up to from 95 to 98 per cent of all the children.

When a child falls and lacerates a hand or bruises some other part of the body, we become very much concerned and give him first aid treatment because we are afraid that he will develop an infection; and that is what should be done, but at least seven out of ten infections that enter the human body enter through the oral cavity. As in warfare, the oral cavity is the first line of defense, and when that first line of defense fails in warfare we call in our shock troops and continue to call in the shock troops until the enemy is repulsed or conquers us. This same thing occurs in our bodies, but, unfortunately, when we lose our first line of defense, we lose our second line of defense, tonsils, the nasal passage and accessory sinuses, for our first line of defense is so closely associated with our second line of defense that we will lose both defenses at the same time. It is my hope that you now understand that the next step in preventive medicine will come from the dental profession. If there was a contamination of our water system, we would not attempt to correct it by some means in the faucets of our kitchens, but we would go to the source of contamination and eradicate it. We must eradicate these contaminations of the human body by going to their source, to young America.

Success is sometimes dependent upon one's appearance, and surely every child should have the opportunity of having a good appearance. If any one of us tried to crash in on Hollywood, the very first thing that would be done would be to have a photograph made of oneself and then that photograph would be

studied, and if there were any mars such as a scar upon the face or a tooth that was turned or twisted it would have to be corrected, for the motion picture industry realizes that one's success is very decidedly dependent upon one's appearance.

Let's think of Chic Sale for a moment; his dad happens to be a dentist. Chic's dad wanted him to become a member of the dental profession, so he took Chic into his office when he was a youngster and Chic became interested in those queer, whimsical characters in which with the aid of artificial teeth which he slips over his own, speech and dress, he has been successful both on the stage and the screen. Yes, appearance does sometimes mean success or failure in one's walk of life. Most of you have not forgotten the late Lon Chaney, one of the greatest character actors the American stage and screen have ever known. Lon Chaney had an almost perfect set of teeth, but he had some ten or a dozen artificial sets of teeth which he slipped over his own so that he could portray those hideous characters that would send a chill up and down your spine, then again brought you laughter. It is Lon Chaney who was credited with the saying, "There is many a capable mind that is hidden behind a hideous face." Surely young America should not be allowed to grow up with defects that modern science can prevent and correct.

THE SCHOOL HEALTH PROGRAM*

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Commissioner of Health of Georgia

FOREWORD

IN THE following outline, we are giving some of the essentials of a school health program. This outline has been prepared because of the increasing number of requests that have come from the teachers of Georgia. They have recognized health as a fundamental aim of education, and see their responsibility and opportunity for doing much to further their pupils' health interests. We have arranged the following material as we studied the reports of authorities in health education. The following have been used as guides:

Health Education (Report of Joint Committee).
Principles and Practices in Health Education.
Child Health (Oregon Tuberculosis Association).
Principles of Health Education—Turner.

We are not attempting to outline a health education curriculum for public schools or to give any course of study, but rather to give the framework upon which the highly privileged communities can build, and yet will furnish the essentials to the child whose teacher can go no further. We offer these suggestions with the hope that the individual teacher will study the health needs of the pupils and the health problems of the community and plan the program to fit those needs.

Adaptation of a health program to fit the local situation is one of the most important factors in the success of the program. Beginnings must be made with conditions as they are; plans for the future should aim at changing the existing conditions in the direction of the ideal.

AIMS OF HEALTH EDUCATION

(As Stated by the Joint Committee on Health Problems in Education)

1. To instruct children so that they may conserve and improve their own health.

2. To establish in them the habits and principles of living which throughout their school life, and in later years, will assure that abundant vigor and vitality which provide the basis for the greatest possible happiness and service in personal, family, and community life.

3. To influence parents and other adults, through health education for children, to better habits and attitudes, so that the school may become an effective agency for the promotion of the social aspects of health education in the family and community as well as in the school itself.

*Official bulletin of the State Board of Health, approved by the State Department of Education.

4. To improve the individual and community life of the future; to insure a better second generation, and a still better third generation, a healthier nation and race.

HEALTH IS A FUNDAMENTAL AIM OF EDUCATION

"Those children receive the best education who are best prepared to take up the active duties of life when school days are over, and successfully fill their places in society."

Present health practices are poor, as evidenced by:

1. Statistics given out by the State Board of Health,
2. Medical reports—survey reports,
3. Observations concerning the spread of communicable diseases,
4. The increase of organic and nervous diseases,
5. The development of physical defects during childhood.

The improvement of health conditions in Georgia will depend largely upon education of the masses. For this, we must depend primarily upon the schools, since the most effective place where any education and prevention can be done is with the youth.

1. Youth is the time of habit formation.
2. Schools reach the whole population.
3. Schools carry the force of public opinion.

HOME, SCHOOL AND COMMUNITY MUST WORK TOGETHER

"Health education is the sum of experiences in school and elsewhere which favorably influence habits, attitudes, and knowledge relating to individual, community, and racial life." In the light of Dr. William's definition of health education, we realize that we must include the home and community in the school health program.

The home is the practice school. Parents must prepare for and direct the child's response to health work in school. It is important that the school make recommendations to parents, and teachers may perform valuable services by visits to homes, and by exercise of their influence in persuading parents to secure the needed health attention and correction for children.

The community health program must expand and become more closely integrated with the whole child-program and community life. "If the school health program is to be conducted efficiently, the school authorities should cooperate to the fullest with the other health agencies of the community and state."

The school is the best approach to the public, and the child is best reached through the teacher. In summarizing the advantages of the teacher's situation in relation to securing the correction of physical defects, Dr. George Collins has said:

"She is trained to deal with children.

"She spends all her time with a small group.

"She has daily contact with the child.

"She enjoys a close relationship with the child.
"She is concerned with the child's all-round development.
"She has educational facilities which the occasional visitor does not."

Every teacher should be a health teacher. "We know that health must be taught as a special subject as well as related to other subjects—but when the health program is built on the philosophy that health is a way of living mentally, socially, emotionally, and physically, we know that it cannot be limited to one teacher in one period but must grow out of and be a part of the child's experience in school and community."

HEALTH PROTECTION

1. Immunization.
2. Adequate Quarantine Regulations.

"The first function of the public schools in the field of health is protection. If the laws are passed demanding that every child attend school, then it is incumbent upon the state to see that the child's health is not injured by that procedure which the state requires."

Immunization is one of the foundation stones of health work in school. "The health education program should develop sound knowledge and right attitudes toward immunization and make pupils intelligent, reasonable, and cooperative in communicable disease control. No immunization program should be undertaken without the support of the local medical profession.

Smallpox.—Vaccine comes in a sanitary glass tube and can be given by any physician. The fluid from the tube is inoculated upon the skin. In about seven days a small blister appears which shows that the vaccination has been successful. If the place is kept clean, dry and not allowed to come in contact with filth, no harm can come from vaccination. No shield or bandage should cover the vaccination. A clean dry cloth may be pinned to the sleeve to cover the vaccination sore. The individual is usually protected for five to seven years and often for life, but he should be revaccinated whenever exposed to the active disease.

Typhoid.—Vaccine comes in three doses and can be given by any physician. The doses should be taken about one week apart. The immunity thus obtained usually protects against typhoid for one to three years, provided one does not become too greatly exposed. Therefore, vaccination is not always a safe substitute for cleanliness of person and surroundings.

Diphtheria.—Toxoid is given for the prevention of diphtheria. It comes in one or two doses. Since diphtheria is usually a disease of early childhood, the sooner the child is immunized after reaching the age of six to nine months the better. Ninety per cent of the children who receive toxoid receive definite protection which it is believed lasts for life. There is also a very simple test, called the Schick test, which the doctor may use to determine whether the child is immune. This test should *always* be done about three months after the toxoid is given, and it should be repeated whenever the child is exposed to diphtheria.

Quarantine.—Every county has a board of health composed of the county school superintendent, the chairman of the board of roads and revenues of the county, or in counties having no such board the ordinary, and a physician appointed by the grand jury. According to the Ellis Health Law, these three members of the county board shall have supervision over matters relating to health and sanitation with authority to enforce and declare quarantine.

If the school is to be conducted as a health center, rather than a disease center, the teacher must be qualified to detect certain suspicious cases among pupils, and unless some school administrative officer is present, the teacher should be authorized to exclude the doubtful pupils. The teacher should not make diagnoses. Every teacher should learn to recognize the signs and symptoms of the more common communicable diseases, and the school officials should back her in excluding cases of communicable disease from the school and allowing them to reenter only by certificate from a physician. The State Board of Health furnishes a bulletin *Rules and Regulations Governing the Control of Communicable Diseases,* also a *Communicable Disease Chart.*

The imitative tendency of children makes it important that teachers try to set an example of healthful living. The school has as much right to demand physical fitness of the teacher as intellectual and moral fitness. Nothing is of greater importance in accomplishing health results than that every teacher and every parent should not only be a health teacher, but an example to children in practices of sensible habits and in the manifestation of sound health attitudes and fundamentals of health knowledge.

AN EXAMINATION FOR CHILD AND TEACHER EACH YEAR

(By a Physician)

The purpose of the examination of school children should be:

To determine good as well as weak points of the individual,
To stimulate interest of child in himself,
To advise child and parents of defects,
To help to make clear the program best suited to the individual.

This examination can be made an educational experience for the child, and as such it has a place in our schools.

The dentists of the state are organized to make dental inspection of school children. All material for this inspection is furnished by the State Board of Health. The State Board of Health, division of mouth hygiene, has planned a *Dental Health Education Program* which has been approved by the Georgia Dental Association, and the Department of Education. The supervisor of Mouth Hygiene will be glad to give information concerning this program.

FOLLOW-UP PROGRAM FOR THE CORRECTION OF REMEDIABLE DEFECTS

"Health service should be utilized whenever possible as a favorable opportunity for contributing to the child. The extent of curative or remediable treatment in the schools should be determined in accordance with the criterion that all school health service should be fundamentally educational in purpose

and character." The school plays a great part in the correction of defects. It is the duty of the parents, primarily, to have defects corrected, but the school should advise. When the parents are slow to act, it is the classroom teacher who can do much to influence the person at fault, either parent or child. We want to teach children to use intelligently the health services in the community rather than expect health of the community. Generally speaking, school children may be thought of in three groups: Those who *can* have corrections and will as soon as parents are advised; those who *will not* have corrections, either because of ignorant or obstinate parents or children; and those who *cannot* afford corrective work. When the school is honestly doing its part and the right relationship has been built up between the community and the school, there is nearly always some aid for the third group.

PRESCHOOL PROGRAM AND PARENT EDUCATION

A great weakness in our health work is the lack of knowledge of the home. Every school health program should take into consideration the preschool program. What the health of the preschool child is determines what the health of the school child is to be. The greater part of this problem is one of parent education. Every school, no matter what the size or how limited the facilities, can have some type of preschool program if teachers realize the importance and are willing to organize. There is always some person or organization that will help with this project. Here is the place for immunization, dental health education, classes in nutrition, and all phases of health work.

SUPERVISION OF THE SCHOOL PLANT

Of very great importance for a satisfactory school health program is the school plant, with all the factors in the surroundings. The schoolhouse with its surroundings should be sanitary, attractive and healthful. Good hygienic conditions in the school building help to keep the children well and happy. They also provide first-hand material from which the elements of good hygienic conditions in the home and community are taught. Children can be taught to take pride in their school building and to cooperate in keeping it clean.

"Intelligently planned, hygienically arranged, well-equipped school plants, kept in sanitary and safe condition are essential to satisfactory attainment in the development and protection of child health. Adequate and well-arranged lighting and seating, properly functioning heating and ventilating systems, reliable equipment for fire protection, approved plumbing, adequate toilet and hand washing facilities are commonly recognized requirements for a healthful school environment."

Temperature is an important factor in the ventilation of classrooms. The classroom should be kept at approximately 68° F. in rooms with direct ventilation, and between 68° F. and 70° F. in fan-ventilated rooms. Teachers should rely upon thermometers, not upon subjective impressions, as an index to temperature. A child may be appointed as the thermometer inspector in grades three and above. The inspector reads the thermometer at stated times and

records the reading on the blackboard. The thermometer should be hung where it will register the temperature of the room at the breathing level of the children. The room should be well aired by opening the windows at recess and during physical activity periods.

Shades should be adjusted to admit proper light and to avoid the glare on desk and blackboards.

Bubbler fountains should be kept clean and used properly so that they will not offer a means for spreading communicable diseases. The best type of drinking fountains is so made that the mouth cannot come in contact with the bubbler while drinking.

Children should be taught to accept responsibility for using the *toilets* in a sanitary way.

Desks and chairs should be adjusted to suit the individual children at the beginning of each school year and as often thereafter as necessary. The seat should be low enough so that the child can put both feet flat on the floor when his hips are pushed fully back in the chair; the thighs should be horizontal so that there is no pressure or strain under the knees. While the desk is being adjusted, the child should sit erect in the chair with arms resting on the desk. The desk should be at such height that his shoulders are in a natural position, neither strained upward because the desk is too high, nor curved forward because it is too low. There should be enough room between the desk and the chair so that the legs will not be cramped. Children should never be allowed to sit with feet not touching the floor. Use a footstool if necessary.

A clean classroom adds to the comfort of the children and helps to train them in habits of neatness. Children should be given responsibility for the cleanliness of the room.

CLASSROOM INSTRUCTION

One of the essential characteristics of a good health teacher is the ability to choose teaching materials intelligently. Health education should be based upon *scientific accuracy* and *educational soundness.* The following questions are given as suggestions for examining all health education procedure and, also, the material used, including textbooks, commercial materials, stories, songs, rhymes, plays, posters, films.

1. Does my teaching contain accurate information? No information should be given to children until scientific accuracy is established.

2. Is it in accord with sound educational theory and practice?

3. Is it well motivated? Is the motivation sound? That is, is it placed within the subject itself? Is it likely to function productively in adult life? Motivation by giving rewards is unsound if judged by these standards. Dr. Strang gives some incentives which may be used as follows:

a. Knowledge of results which children are achieving.

b. Praise that is specific, spontaneous, objective, and deserved rather than praise which is used consciously by adults to affect behavior.

c. Rewards that any one who puts forth sufficient effort can attain, avoiding those which only a few can attain and, also, those which encourage falsification.

4. Is it suited to the intelligence level and related to the common experiences of the children with whom it is used?

5. Is it positive? Does it provide for the derivation of satisfaction from the right conduct rather than from dissatisfaction with the wrong? Does it respect the child's right to a feeling of security by avoiding the fear element?

6. Does it provide for situations or activities in which the child may learn by doing? Can he wash his hands at school before eating? Is he encouraged to drink milk, and is there a safe place provided for him to keep it?

7. Does it provide satisfaction in any way for things the children have done?

8. Does it provide for the use of materials at hand and as they occur in life? This standard suggests the use of a "grocery store" or a "cafeteria" in teaching good foods for boys and girls, instead of a "health house" built of foods.

9. Does it reproduce actual life situations? Is it real? Since the goal of health teaching is to establish desirable habits and attitudes, experiences and situations based upon reality should be used rather than phantasies and dreams. The latter may entertain, but do not suggest adventures which the child can translate into his own health behavior.

10. Be especially critical of advertising materials lest you use something planned chiefly for the purpose of selling a certain commodity. Much advertising material is educationally and scientifically sound; much is not.

PHYSICAL EDUCATION PROGRAM

The physical activities of children contribute directly to health. Success in such activities serves as one measure of health. The desire to succeed in physical accomplishments is a stimulus toward the development of health habits. The teacher who develops a close relationship between physical education and health training strengthens both. Some form of physical activity should be available to all boys and girls, the type selected being dependent upon physical condition. Abundant contribution to health of body, mind, personality, and character should be made by a rationally sound program of physical education.

WEIGHT AND MEASURE

This routine procedure is a part of a perfectly sound health education program. May we quote Dr. C. E. Turner, of Massachusetts Institute of Technology, who made a careful, scientific study of the weighing and measuring of school children. "Children should be weighed every month as a part of the program to improve health practices. Growth is a sign of health. Sick children do not grow well. Children wish to grow and they will therefore do the things that make them grow. Growth is a sign of success in healthful living and therefore a measure of accomplishment. Of course, failure to gain for a single month is not serious, but reasonably continuous and consistent growth is a sign of good health. A child readily sees the relationship between his growth from month to month and his success in keeping the rules of health. The teacher can make no better use of the time required for teaching health

than to weigh her pupils once a month. As to the idea of a contest, it is obviously impossible, and perhaps undesirable, to ask a child to achieve a so-called 'normal weight' when he is thin, not because he is unhealthy, but because he has inherited a slender skeleton.''

Some of Dr. Turner's conclusions about weighing children are these:

1. Underweight should not be used in the classroom either as a teaching device or as a measure of success of health education program.

2. The teacher should weigh pupils regularly and use the child's interest in growth as an incentive toward the development of health behavior.

3. It may be well for a teacher to look into the cases of children who have failed to gain over a period of three months or more.

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American Dental Association, 212 East Superior Street, Chicago, Ill.
American Child Health Association, 50 West Fiftieth Street, New York City.
Child Study Association, 22 West 57th Street, New York City.
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ACTIVITIES OF THE DENTAL DEPARTMENT OF THE MILWAUKEE HEALTH DEPARTMENT

L. A. Gerlach, D.D.S., Milwaukee, Wis.
Dental Director of Health Department

ALL public health work carried on in any organized community has as its basis prevention. The divisions for communicable disease, sanitation, venereal disease, tuberculosis, and all branches of a functioning health department have prevention as their aim. With these thoughts in mind, and with a full knowledge of what the dental profession has to contend with, it is logical to assume that any dental health project, in order to be constructive and beneficial for generations to come, must be preventive in nature.

Although the aim of prevention is paramount in the dental health program in the Milwaukee Health Department, some provision has been made in the personnel and arrangement to allow for a limited amount of operative work so necessary for relief of the indigent families. This compares with the set-up of the other divisions of the health department.

The communicable disease division has an isolation hospital to receive patients; the tuberculosis division is able to refer patients to a county sanitarium; the school hygiene division is able to refer patients to both a county hospital and a children's hospital, and the venereal disease division is able to refer patients to a county hospital.

As there was not any well-organized dental clinic in Milwaukee, city or county, at the time that the dental health program was instituted, it was necessary for the health department to make some provision for emergency dental treatment for the severe cases of infection found in the schools by the oral hygienists. This service was instituted at the earliest possible time after the appointment of the first hygienists. Therefore, at present the dental division of the Milwaukee Health Department consists of the oral hygiene group and the clinic group, both functioning under the dental director, and working hand in hand to make a well-rounded dental health program.

The difference in the duties of the oral hygienists and of the dentists in the clinics makes it necessary to discuss each group separately, and then show the association between them. The oral hygiene group will be discussed first, with a brief outline of the school system so that the reader may better understand the set-up.

The oral hygiene group carries on all the dental educational work in the public and parochial graded schools in the city. The personnel is composed of five oral hygienists, working six hours each day, nine months of each year. The hygienists work during the school year, and conform their program to school hours. They begin their year September 15, and terminate it June 15, working from 8:30 A.M. to 3:30 P.M. five days of each week.

The total enrollment and number of graded schools 1932-1933 are listed in Table I.

TABLE I

	NO. OF SCHOOLS	ENROLLMENT
Public schools	87	54,385
Parochial schools	83	30,564
Total	170	84,949

Each hygienist is equipped with a portable chair with detachable cuspidor, aseptic stand, and a complete set of prophylactic and examining instruments.

Because of the fact that a great number of the schools of the city have an enrollment of over 800 pupils, the five hygienists have been grouped into two teams of two each, with the odd hygienist working alone in the smaller schools.

The hygienists make their contacts at the school and arrange a schedule of their activities with the principal. Whenever possible the dental director makes the contacts for the hygienists. When the contemplated contact is made, the nurse in the school is notified in order that she may be ready to assist in any way possible to help make the program a success.

With the entrance of the hygienists into the school the portable equipment is set up in the nurse's room, or any other suitable room in the building having sufficient light and ventilation with running water close at hand.

Each child in the kindergarten and first four grades is given a dental examination, and the findings are recorded on a permanent dental record card. This permanent record card is so designed to serve through the complete graded school career of the child. When the hygienist completes her visit, it is filed in the health envelope in the school file and at subsequent visits is removed and new recordings are made. In this way a dental check-up on each child to the fifth grade is available at all times. All cases examined are classed, according to severity, with the following symbols: single X, double X, and triple X. Single X, mild; double X, bad; and triple X, very bad. Each child needing dental care is given an envelope containing a notice of the defect, and a booklet about care of teeth, to be taken home to the parents. The triple X, or very bad cases, are referred to the school nurse for follow-up work.

When the hygienists have completed their examinations, they begin their lecture work. Each class is given a separate lecture on toothbrush instruction, this being carried out in the classroom. Two or three classes are then grouped in the auditorium, and a lecture with the aid of slides and movies is given on tooth development, diet, and mouth cleanliness. Suitable posters and slogans are distributed around the school by the hygienists when they enter, and when they leave a poster is left with the principal to be placed in a conspicuous place in the school.

When the examinations, classroom and auditorium lectures are finished, the hygienists begin a series of prophylactic treatments. These prophylactic treatments are given to all the children in the second and third grades only.

The program is so arranged that each school in the city will be visited at least once every year and a half. The prophylactic treatments are primarily given to teach mouth cleanliness, and if a school child receives one prophylaxis in conjunction with the well-rounded program, it will help to impress upon his mind the value of mouth cleanliness.

Following the prophylactic treatments and when completing the program in a school, the hygienists conduct a sale of toothbrushes. With the aid of the teachers and school nurses the children are encouraged to purchase toothbrushes. This procedure has proved very satisfactory, and has helped a great deal to impress upon the children's minds the need to brush their teeth.

As the dental department is a branch of the health department, and not part of the school board, all the follow-up work is done by the health department nurses. The nurses see the children in the schools and make all the necessary home calls. At present the nurses are only able to follow the very bad, or triple X, cases because of the great demand for their services. However, up to three years ago all parents of children receiving notices of dental defects were contacted in the home and referred to either the family dentist or the health department clinics. All dental corrections when completed are entered by the nurses on the permanent dental record card. In this manner the hygienists at their next visits have a record of whether or not the children have obtained dental treatment.

The foregoing program is carried out in all the graded schools in the city of Milwaukee at present. In the school year ending June 21, 1934, 115 schools having a total enrollment of 54,725 pupils received a dental health educational program.

As an aid in determining the status of the community both financially and dentally, a standard of rating schools was adopted in September, 1933. The nurses working with the grade school principals rated each school on the following basis:

Schools having less than 25 per cent indigent children—good.
Schools having between 25 and 50 per cent indigent children—medium.
Schools having 50 per cent or over indigent children—poor.

By using this standard of financial classification we were able to obtain the number of dental defects in each particular class of schools. Table II was compiled to give the actual conditions of a number of schools picked at random from each class.

We realize that these statistics are very poor but true. The fact that a great number of people have not been able to consult the private practitioner for dental service for their children, plus the crowded conditions of our clinics, brings the percentage of corrections down, and the percentage of infection and oral cleanliness way up. However, the only way to face the problem of adequate or proper dental care for the children both rich and poor is to know the true condition in the community or all communities.

The operative group functions in three dental clinics in the city. The personnel is composed of three full-time dental operators, one in each clinic,

and two half-time operators working ten months of the year in two clinics with the full-time operators.

The following policy in regard to entrance to the clinics for free dental care has been adopted: All children of indigent families are eligible for free dental care. The indigency is established by the school nurse. When the parents present themselves to the nurse for free dental care, the nurse is required to make out a social history which is a detailed account of the financial

TABLE II

STATISTICS ON 50,000 SCHOOL CHILDREN

35	Medium schools 25 to 50 per cent indigents
38	Poor schools 50 per cent or over indigents
27	Good schools less than 25 per cent indigents
Total 100	

	GOOD	MEDIUM	POOR	AVERAGE
Abscess cases	15%	15%	17%	16%
Condition of first permanent molar:				
Decayed	39%	46%	48%	44%
Missing	3.3%	4%	7%	5%
Cases free from dental caries	9%	8%	8%	8%
Oral cleanliness:				
Good	31%	24%	16%	24%
Fair	19%	20%	19%	19%
Poor	50%	56%	65%	57%
Evidence of professional dental care received:				
Adequate	14%	13%	7%	11%
Partial	26%	25%	21%	24%
None	60%	62%	72%	65%

status of the family. She is assisted in this work by the various social agencies operating in the city. When the history is complete, it is compared with a budget sheet. This budget sheet was drawn up by the dietitians and social welfare agencies in the community, and contains a detailed accounting of the cost of maintaining any family regardless of size. By comparison it is determined whether the family is eligible for free dental care, and if so the nurse refers the children to the clinic.

The clinic procedure is as follows: All children under twelve years of age receive complete dental care, which consists of amalgam and kryptex fillings in deciduous and permanent teeth, prophylaxis, extractions, and x-ray work when necessary. Children over twelve years of age receive emergency work only. This consists of sedative treatments, extractions, and an occasional filling when the tooth being treated can be saved.

With the extensive program of dental education carried out in the schools, it is easy to realize the number of child patients streaming to the clinics. With the limited number of dental operators on the staff it is possible only to barely scratch the surface of endeavoring to take care of all of them adequately. This being the case, we have stepped up the extraction service considerably the last two years, feeling that at least we are able to remove the badly infected and painful teeth causing the greatest damage at present.

Gas extraction clinics are held two and three mornings each week, depending upon the number of cases on file, in two of the three health centers.

At each clinic 18 children are given appointments and receive the extraction service. Each child is given a physical check-up by one of the physicians on the staff before the general anesthetic is administered. This procedure has been followed for years and has proved very satisfactory.

In addition to the extraction clinics under nitrous oxide oxygen anesthesia, the dentists in each clinic perform a considerable amount of extraction work under local anesthesia. This is necessary for emergency cases.

The need for both dental educational work and actual restorative dentistry is very great today. The educational work is preventive dentistry in its highest form and cannot be stressed too greatly. However, the crying need for dentistry for the masses is becoming greater each day. We have tried to build a program which will include all the essentials necessary for a successful program, but still not interfere with the private practitioners in their work.

TIMMY McGONIGAL GOES TO CAMP*

H. Shirley Dwyer, D.D.S., Brooklyn, N. Y.

IT IS a fine warm evening and the head of the house of McGonigal is taking his ease on the front stoop of their flat somewhere in Hell's Kitchen.

His pipe has gone out, and his blue eyes are closed in sleep. Maybe he is dreaming about the Ireland of his boyhood days, maybe he is not dreaming at all, when a light touch on his arm brings him up with a start as—

Dental Hygienist: Pardon me, are you Mr. McGonigal?

Mr. McGonigal: Faith, and you startled me. McGonigal is right, and what might I be doin' for ye, miss?

Dental Hygienist: You have a little boy, Timmy—

Mr. McGonigal: Phwhat the Divil's that rascal been up to now? Sure, I'll skin him alive if he's been after breaking any more winders.

Dental Hygienist: No, no. Timmy has not been in trouble, but he is being sent to camp along with a lot of other little boys next week, as you know, by the Neighborhood Association, and that is what I want to talk to you about. Before we can take any of the boys to camp, they must be examined by a physician and a dentist. The examination showed that Timmy had no other physical defects, but he has to have his teeth fixed. We find that Timmy has four cavities and six pits that should be attended to by the dentist.

Mr. McGonigal: It's teeth that ye are talkin' about! Why the lad's no more than seven years old. Now what under the sun can a little lad like that be doin' about his teeth . . . they're only his first wans anyway.

Dental Hygienist: Very true, Mr. McGonigal, they are only his first or baby teeth that have the *cavities* in them, but the *other* defects are in his permanent teeth, and besides, we want you to take just as good care of those baby teeth as you would of the permanent ones.

Mr. McGonigal: Indade now, and I suppose you're going to be tellin' me that those baby teeth of his should have fillin's put in them befoor they're pulled out.

Dental Hygienist: No, they should have fillings put in them so they *won't have* to be pulled out.

Mr. McGonigal: Phwhat's that agin?

Dental Hygienist: The baby teeth should always be filled, and then they will not become so badly decayed that they will have to be extracted. If those

*A radio dialogue.

baby teeth are extracted before they should be, the shape of Timmy's face might be very seriously changed. Also a decayed tooth—regardless of whether it is a baby tooth or a permanent one—is liable to give him a toothache.

MR. MCGONIGAL: Thin you mean to tell me that if Timmy has a hole in whan o' thim baby teeth, the dentist should stop it with a filling?

DENTAL HYGIENIST: Exactly. If Timmy's baby teeth are neglected and allowed to become decayed and eventually extracted, what is he going to eat with? That is one reason why his teeth must be fixed before he can go to camp. We are going to give him plenty to eat—nice fresh vegetables and clean wholesome milk; but if he can't chew his food, what good will it do him?

Timmy is growing very, very rapidly just at his age, and he needs all the nourishment he can get. He must eat plenty of green leafy foods, which will help to build bone and make good strong teeth. He must have plenty of hard food to give his jaws exercise so that they will grow straight and strong, but he will not be able to do all this chewing if his teeth are not good. The food which Timmy eats very seriously affects his teeth while they are growing. Once his teeth are all in his mouth it is different, but during the time that his teeth are being formed they must receive the proper nourishment or else they will be full of cracks and flaws—pits and fissures.

MR. MCGONIGAL: And what might they be?

DENTAL HYGIENIST: Pits and fissures?

MR. MCGONIGAL: Yis.

DENTAL HYGIENIST: They are places in a tooth where it has not been properly built.

MR. MCGONIGAL: Ooooo—like bubbles in plaster.

DENTAL HYGIENIST: That is it. Are you a plasterer?

MR. MCGONIGAL: Oi am that.

DENTAL HYGIENIST: Then you can readily understand what I mean. If you and another man are plastering a wall, you are careful not to leave any spaces between the two sections of plaster when you join up your work, aren't you?

MR. MCGONIGAL: Right you are, entirely. It's a cracked wall you'd be havin' if you don't.

DENTAL HYGIENIST: Well, that is exactly the way your teeth are built—in sections, and then these sections join together. If the joint is not perfect, you have a crack or fissure in the tooth. These fissures are natural weaknesses which allow the tooth to decay at that place. Do you realize, Mr. McGonigal, that in every one of those little tiny cracks there are over eight billion bacteria?

MR. MCGONIGAL: Howly Saints! Eight billion bugs in one hole. It's terrible, terrible; but phwhat the Divil can *I* do about it?

DENTAL HYGIENIST: Let me take Timmy to our dentist and have those defects fixed before they get any bigger. Then he can go to camp and you won't have to worry about his having any toothache.

MR. MCGONIGAL: Foin, but would you moind showing me what's wrong in Timmy's mouth?

DENTAL HYGIENIST: Of course not.

MR. MCGONIGAL: Timmy! Timmy, ye young spalpeen. Come here this minute or I'll take me two hands to ye. Now thin, the lady wants to be showin' me your teeth. Niver moind talkin' back about it—open yer mouth and shut up!

DENTAL HYGIENIST: Now, Mr. McGonigal, if you will just look here—and here—and then way back there—you see those cavities?

MR. MCGONIGAL: Mmmm—I do that—but how about thim fish ye were tellin' about?

DENTAL HYGIENIST: Oh, the *fissures* . . . here they are, but you probably cannot see them very well as they naturally are very small.

MR. MCGONIGAL: Howld still,Timmy. Divil a bit now do I see in your mouth but wather, but if its defects ye got, they'll be fixed. There'll be *no* defective McGonigals if I can help it. Timmy, do you know what the lady says? She's after tellin' me ye've got some big holes in your teeth, and I saw thim there with me own two eyes. Besides that ye've got some other things that she calls fissures that are just like bubbles in your teeth, and they're not good, Timmy, they're not good. If ye iver see a wall that's new and has a crack in it, I bet it will be first in the corners of the room where the walls join togither. She says it is loik that in your teeth—so go along now, be off wid ye with this nice lady and get your defects fixed.

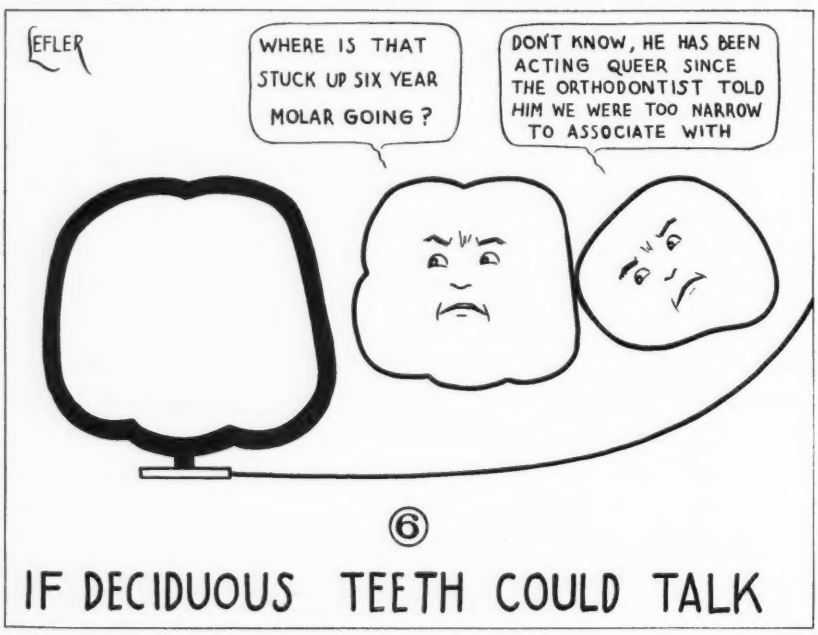
DENTAL HYGIENIST: Thank you so much, Mr. McGonigal, we will take good care of Timmy.

MR. MCGONIGAL: Good-bye . . . Timmy, Timmy me boy, ye don't know what a lucky divil ye are, livin' in a country where they even look after your teeth. Sure when I was a boy, teeth were like pertaties—they just grew. The only difference was we looked to the care of the spuds; but here, the Saints be praised, we're raisin' *men*—not pertaties.

IF DECIDUOUS TEETH COULD TALK

HARRY B. SHAFER, D.D.S., ANNA, ILL.

IF DECIDUOUS teeth could talk, they might sound a few warnings concerning malocclusion in early childhood. Orthodontists may differ as to methods of treatment and not agree on the age that appliances should be placed, but they are united in one opinion—that the general practitioner usually sees the patient



first and has a wonderful opportunity to advise early supervision by a competent specialist.

The fact that the general practitioners do not attempt corrections is no excuse for their not being always on guard against facial deformities.

Department of Orthodontic Abstracts and Reviews

Edited by

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All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. Egon Neustadt, 133 East Fifty-Eighth Street, New York City.

A Spanish Textbook on Orthodontia. Review of "Orthodoncia Practica" by Dr. Oscar M. Aldecoa, Impresora Uruguaya, S. A., 1933, Montevideo.

A fairly comprehensive chapter on occlusion starts this textbook on its road through the realms of orthodontia. The masticating apparatus is first discussed, namely, the calcification and eruption of deciduous and permanent teeth, and the configuration of their occlusal surfaces. Then the physiology of mastication is taken up and exemplified with some unusually fine illustrations; one of them is here reproduced (Fig. 1), showing the comparative position of incisors and molars during centric and eccentric movements (Gysi).

The following chapter defines the different types of malocclusions. Angle's method of classification is briefly given, but its value is limited to "intraoral" diagnosis. It is supplanted by Simon's gnathostatic diagnosis, which is described in great detail, and the terms of which (contraction, protraction, retraction, etc.) are accepted. (Perhaps, a little too much emphasis and space are given to this method.)

Among the etiologic causes of malocclusion, there are mentioned: inherited causes, constitutional diseases, endocrine disturbances, rickets, malnutrition (vitamin deficiencies), infectious diseases, specific diseases (syphilis and tuberculosis), local disturbances, disuse, traumatic injuries, periodontal diseases, posture habits, abnormal breathing, and congenital causes. (The listing of periodontal disease as an etiologic cause of malocclusion may be subject to misunderstanding. In most instances, it is the malposition of a tooth which brings about traumatic occlusion, food impaction, lack of occlusion, or other conditions which in turn produce injury to the periodontal tissues. Thereby, a vicious cycle is established, because the breaking down of the injured periodontal membrane may accentuate the malposition of the tooth.)

The use of the roentgenogram is stressed as the first diagnostic aid. Then the taking of plaster and compound impressions (full and partial) is described, and the making of the casts (plain and gnathostatic). Instruction is also given in the taking of photographic records. As a further aid in diagnosis, graphic methods are suggested, among them William's ondontograph, Gilpatric's method, and Stanton's charts.

Before the discussion of orthodontic treatment, the physiologic considerations regarding it are placed before the reader in a clear and thorough man-

ner. These include the histology and biology of alveolar bone, periodontal membrane, cement, and a summary of animal experiments conducted by the different investigators.

The chapter on treatment gives the making of anchor bands according to several methods, the construction of labial alignment wires, lingual appliances with auxiliary springs, high labial appliances, tube and pin appliances, bracket bands and edgewise arch, space retainers, and retention devices. Their use is illustrated by means of a large number of treated cases.

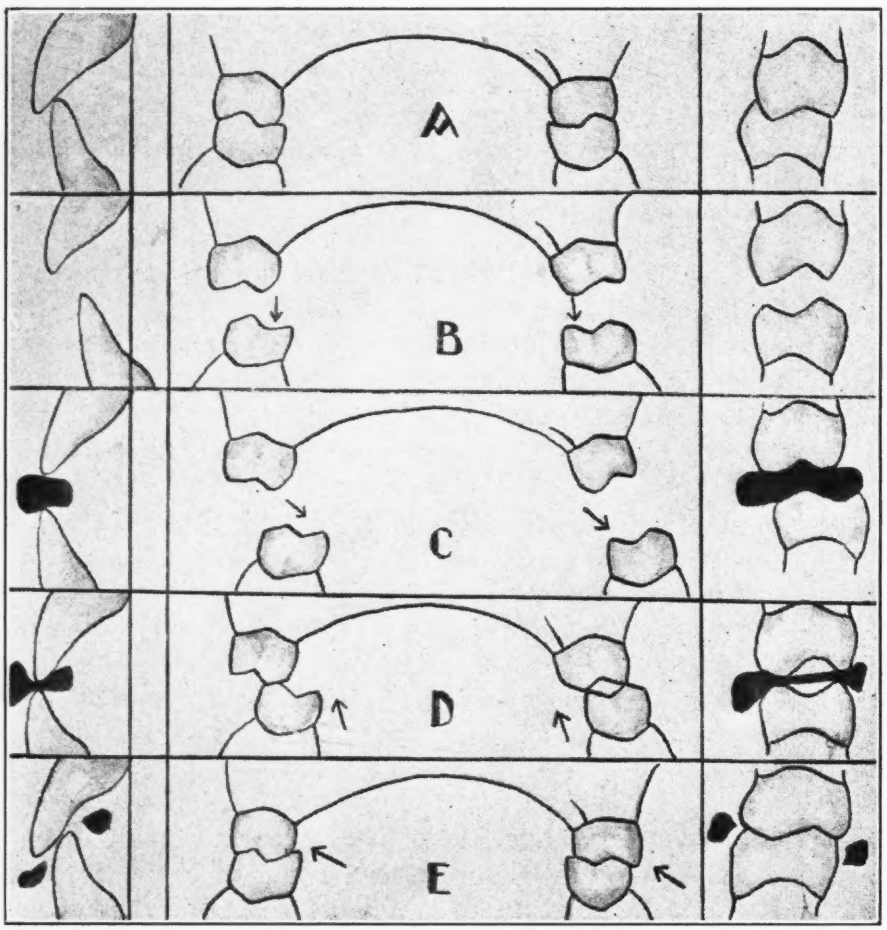


Fig. 1.

The illustrations are numerous and instructive. The text is, as a whole, nicely balanced, and covers all important questions adequately, the author proving himself well acquainted with the entire orthodontic literature. Divisions and subdivisions of the chapters are, however, not always logically arranged; one also misses a table of contents which, especially in a textbook for students, would no doubt be a worthwhile feature. Cover, paper, and print are most satisfactory. No doubt, this book will be of great value to orthodontic students of Latin America and also of Spanish speaking orthodontists the world over.

E. N.

A Spanish Orthodontic Journal. This department has received the announcement and the first number of a new orthodontic journal, which is written in the Spanish language and, therefore, is of interest to Spanish speaking orthodontists. The journal's name is "Resena Odontologica." It is published in Montevideo and appears bimonthly. Its editor is Dr. Oscar M. Aldecoa.

The first issue, consisting of 20 pages, contains the following articles: the physiologic movement of teeth, by Dr. Francisco M. Pucci; the construction of molar bands by the indirect method, by Dr. Andres O. Pisacco; the treatment of mutilated cases, by Dr. Oscar M. Aldecoa. The articles are illustrated by 38 figures.

This new publication is, especially under the present economic conditions, an encouraging and creditable undertaking, considering the fact that even some of the larger European countries have no journal exclusively dedicated to articles on orthodontia.

E. N.

THE FORUM

Articles for this department should be sent to Dr. Albert H. Ketcham and Dr. William R. Humphrey, 1232 Republic Bldg., Denver, Colo.

Naming the Fee

Dr. Flesher's article in the September Forum on "Counting the Cost" revives in my mind the old problem, "How to name a fee for orthodontic service."

One of the first questions asked when the patient is presented is, "What will treatment cost?" Many orthodontists immediately "set" a fee. In most cases it is an arbitrary amount regardless of the type of case or the physical condition of the patient. Many times the charge is made without the aid of x-ray pictures in diagnosis; therefore, the orthodontist is taking a "leap in the dark." Even after having in advance all procurable aids to a correct diagnosis, the orthodontist is assuming a great risk of loss of time and prestige when he names a set fee for the treatment of any case of malocclusion.

What would a patient, presenting for treatment of tuberculosis, think if the physician should tell him he would effect a cure for a certain amount of money, and in a few months' time? You might say, in making a set fee, that you do not guarantee a perfect recovery in an orthodontic case, but this is what it actually amounts to in the patient's mind and as long as one tooth remains in abnormal occlusion you are responsible to the patient for its correction if you have made a set fee. In making a set fee in an orthodontic case you immediately tear down in the patient's mind the high professional standard he expected to find when he came into your office, and build up in his mind the idea of bargaining. Not only that idea is fixed, but also you relieve him of all responsibility and heap this load upon your own shoulders. Some men, instead of making a set fee, will agree to charge for the case for a certain number of months after which, if the case is not completed, treatment will continue without charge, which again places the responsibility entirely upon the shoulders of the operator.

As I see it, this method is wholly unprofessional; unfair to both patient and orthodontist; and unnecessarily places the responsibility on the person who is the least able to correct any fault in cooperation of the patient. This is a very important point, and many times spells failure.

This condition is easily circumvented at the beginning when the parent asks, "Doctor, can't you tell me how much it will cost?" or "I would not mind starting if I only knew how much it would amount to." You can explain to

him, "Each case is an individual problem of growth and development, and there is no way for you or me to tell how fast the case will respond to the stimulation applied by means of appliances." There is no certain way for you to tell in advance how the patient will cooperate in following out instructions or in keeping appointments. Then explain that it is a biological problem, and not the kind of problem a carpenter has when he estimates the cost of a building from specified plans.

How many times have you seen cases for which a set fee was charged turn into the prolonged type which work an unnecessary hardship on the operator because of lack of a sense of responsibility on the part of the patient and interest on the part of the parent, when, if the orthodontist had charged a monthly or yearly fee, it would have been satisfactorily completed in a reasonable length of time?

Let us place our profession on a professional basis and be honest with our patients. Tell them you cannot say how long the treatment will last. Charge for the time and skill that you have bought dearly. Your service and knowledge are worth as much, if not more, the last month as the first month of treatment; and remember the condition of the child is not your responsibility, but the parents'.

Frank H. Harrison.

Identical Twins?

I should like to take exception to the article entitled "Cleft Palate Found in Only One of Identical Twins," by Dr. Harry Wright of Philadelphia, INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN, July, 1934. I assume that such an exception may be taken in a purely impersonal way through this medium.

Where is the proof that the twins were identical? In selecting his title, the author assumes the responsibility of supplying this proof. He dismisses it somewhat casually with the statement, ". . . he is one of so-called 'identical' twins, the attending physician's affidavit to the fact that only one placenta existed." To me, at least, this statement is decidedly inadequate.

Williams, in his textbooks of obstetrics,* says of twins, ". . . when they are derived from a single ovum there is a single large placenta from which the two umbilical cords come off; and when they are developed from two ova, there are usually two separate placentas, although when these were originally inserted near one another, their contiguous margins may fuse together, thus giving rise to an apparently single large placenta, in which, however, there is no connection between the circulation of the two twins." Thus, the differentiation between a single and fused double placenta may be a most difficult one to make.

Did the physician referred to by the author make a detailed examination of the placenta? If so, what was his method of examination, how thorough was

*Williams, J. Whitridge: Obstetrics, New York, 1925, p. 406, D. Appleton & Co.

it, and what, exactly, were his findings? What were the findings with regard to the chorionic and amniotic membranes?

If proof is available, this paper can be considered a most valuable contribution to our knowledge. If it is not available, it can be considered nothing more than a case report of the treatment of a case of cleft palate, and the title is not justified.

Charles M. Waldo.

The Rotation of Mandibular Premolars

The mandibular premolars being nearly the same diameter buccolingually as they are mesiodistally, or in other words, presenting occlusal surfaces which are somewhat circular, are often left in rotated positions of malocclusion.

In most cases presenting underdevelopment of the mandibular arch, the mandibular premolars are rotated from their normal positions to malpositions, which greatly increases the area of proximal contact. It is this abnormal con-

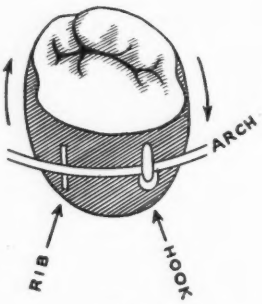


Fig. 1.

tact with the danger of subsequent decay and peridental lesions, as well as the necessity for restoring normal functions, which makes the rotation of these teeth imperative.

The rotation of these teeth to their normal positions should be started, if possible, when treatment is instituted. One of the best methods of procedure in rotating these teeth has been suggested by Ketcham through the use of the hook attachment and auxiliary rotating rib as illustrated:

"The arch wire of about 0.022" diameter passes through the hook, which is placed, as illustrated (Fig. 1), on that portion of the labial surface of the band from which the force used to effect rotation should be exerted in a labial direction. A rib is attached to the opposite portion of the labial curvature of the band, in a position parallel to the long axis of the tooth, so that the arch exerts pressure outward through the medium of the hook, and inward through the medium of the rib. For example, in the case of a bicuspid having the mesiolabial surface rotated outward, the hook, after having the base reduced so that the slot formed by the hook and band makes a snug fit for the small arch wire, is placed off center as far back on the distolabial surface as practicable. Then a little rib of wire is soldered in a vertical position on the buccal surface of the

band near the mesiolabial angle to raise that surface of the band to the same height as the center of the buccal or labial crest of the band. Care should be taken to align the arch wire in a horizontal plane through the hook and over the rib."

W. R. H.

Pathologic Condition of Operative Origin

Very little has appeared in the literature about the effect of maxillary sinus disease upon the teeth; although much has been written about pathologic dental processes as a cause of maxillary sinus disease.

The relation of dental disease and operations upon this sinus has also received slight comment. A paper by Ivy on this subject, relating to the examination of cases operated by Skillern and Coates, denied injury to teeth or their nerve filaments. This, however, covered adult patients only.

In many operations performed during the last decade from single puncture of this cavity, through either the inferior or the middle meatus, to the more radical procedures having been performed on children of various ages, we may look for and find pathologic condition of operative origin.

The following cases, with illustrations, show the possibilities even in experienced hands. A warning should therefore be sounded to the rhinologist to be especially careful in operating in this region before the eruption of the permanent teeth.

T. E. Carmody.

R. H. presented for orthodontic treatment at twelve years of age with history of previous maxillary sinus disease. Following is the rhinologist's report: "May 1, 1919, R. H., aged nine years, nine months; polypi removed from left choana. Came from posterior end of middle turbinate. Smear shows streptococci and staphylococci.

"September 13, 1919, polypi have returned. Radical operation through left canine fossa. Membrane found to be greatly hypertrophied with numerous small polypi in the left sinus. Large mass of polypi coming out the maxillary osteum into the left middle concha.

"No malignancy found under section."

Radiographs made in November, 1921 (Fig. 2 *A*), for the purpose of orthodontic diagnosis revealed that the unerupted left maxillary canine pulp chamber was obliterated, presumably through a deposit of secondary dentine.

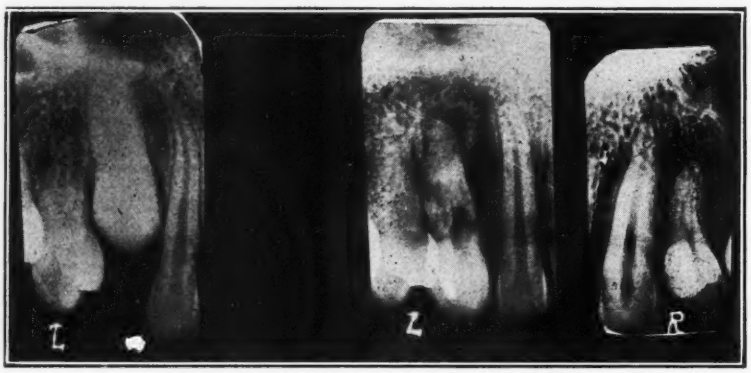
Orthodontic treatment was instituted to correct the malpositions of the erupted teeth. Normal space for the unerupted left maxillary canine was secured, but radiographs made in September, 1922, showed that this canine had made no progress toward erupting. A pin attachment was placed in the lingual surface of the crown, and light spring pressure was applied to move the tooth downward; however, it did not respond, and with increase in pressure from the appliance the other maxillary teeth were depressed. The extrusive stress exerted upon the unerupted canine was changed to one exerted in a labial direction, and the tooth was moved labially and then downward into normal posi-

tion. Radiographs made in December, 1923, revealed that resorption was taking place in the labial and distal portions of the root.

Pressure applied to this tooth was heavier than usual, since the operator realized that the tooth must either be placed in normal position or be extracted.

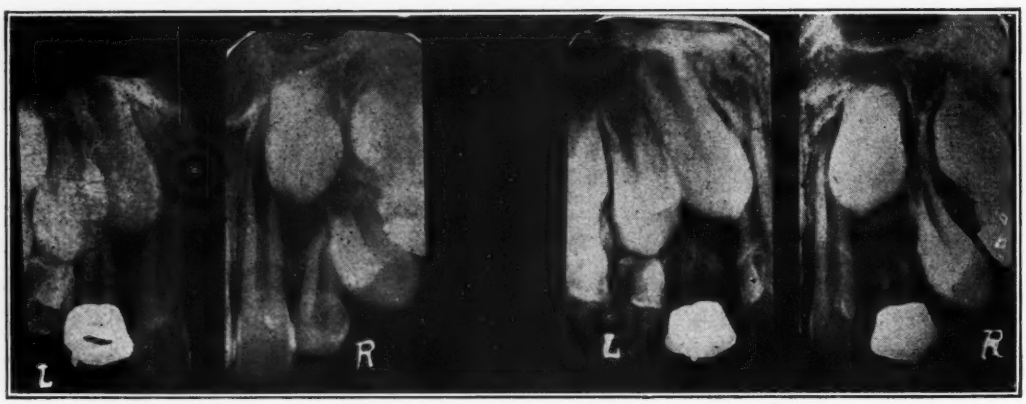
In January, 1927 (Fig. 2 *B*, left side), radiographs revealed that root resorption was progressing and also that there was an apical abscess, so the tooth was removed. The normal right canine is also shown in this illustration.

J. C. presented for orthodontic diagnosis April 1, 1932, aged nine years. History given by parents of right maxillary antrum operation, opening throuh canine fossa, in May, 1930, when J. C. was seven years old.



A. *B.*

Fig. 2.



A. *B.*

Fig. 3.

Radiographs made April 1, 1932 (Fig. 3 *A*), show that the right permanent canine pulp chamber apparently has been filled with a deposit of secondary dentine, also that the left permanent canine is forming normally.

Radiographs made February 11, 1933, show that the left canine has made progress in root growth, while the right canine has made none (Fig. 3 *B*).

Shortly after the radiographs were made in February, 1933, the deciduous canines were removed in order to treat the radiolucent areas which show between the deciduous canine roots and the crown tips of the permanent canines. The deciduous left first molar was also removed.

A. H. K.

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EDITORIAL

Resolutions on Orthodontic Education

ORTHODONTIC instruction and education, both graduate and undergraduate, are again in the spotlight; possibly this is a result of the recent publication of the report of the Committee on Orthodontic Education of the American Society of Orthodontists and of resolutions on orthodontic education passed by several orthodontic societies. In addition to this, the Curriculum Survey Committee of the American Association of Dental Schools has completed its report on the dental school curriculum. In this report the section on orthodontic curriculum suggests particularly the doubling of the hours which are at the present devoted to the study of orthodontia in the leading dental colleges.

Postgraduate courses on this subject, of various and sundry kinds, have been given for years. There have been offered short courses and long courses, university extension courses under the regular university program, and private office courses, study club and dental society teaching; even night school courses have been given. Such courses have been equally as varied in duration of time and effort expended as in the curriculum followed. Some have consisted of a few hours a week of clinical work over a period of weeks; others, intensive full-time work for the student from one to ten weeks, and one at least even has required full-time intensive study for a year. Some courses have been given primarily for general practitioners, and others have been designed for training those who intend to specialize.

In any event, there is a wide diversity of opinion within the ranks as to just what constitutes proper and adequate training in orthodontia. This chaos of opinion in dental schools is exemplified in the report of the Committee on Orthodontic Education of the American Society of Orthodontists (Earl G. Jones, Chairman), which was recently published.* After surveying 43 dental schools in the United States and Canada, the Committee made observations which are both important and interesting:

"Ten of these schools express themselves as favoring the instruction of undergraduates in orthodontia to the extent of teaching them to treat all except the most difficult cases. One school through a special elective curriculum teaches the students electing the special curriculum to treat all cases . . . the lack of common agreement on orthodontic education for the undergraduate student of dentistry is clearly shown in the clinical study of orthodontics, and 17 schools report that this study is optional with the students. One school gives no clinical instruction at all. Definite information accompanying the reports indicates that the clinical instruction in several schools consists entirely of demonstrations, the students treating no cases. In 17 schools the instructors make the clinical adjustments of orthodontic appliances, and 21 schools report that the students adjust the orthodontic appliances, the instructors assisting in 6 of them. The appliances are made by the students in 23 schools; they are made by demonstrators or technicians in 18 schools; and 4 schools report that the appliances are purchased ready made. The amount of time devoted by the undergraduate to the clinical study was reported by 36 dental schools. It ranges from 16 hours (the lowest) to 260 hours (the highest), with an average of 83 hours."

Under the heading of "Orthodontics and General Practitioners of Dentistry," as a result of information secured from questionnaires, the Committee reports that the data indicate that there is a considerable percentage of dentists who treat cases of malocclusion, purchase some or all appliances ready made or have them made by commercial laboratories. The Committee comments that this is indeed a deplorable situation, but in this respect that orthodontic service is probably not very much different from several other types of dental services.

*International Journal of Orthodontia and Dentistry for Children, August, 1934, page 784.

Simultaneously with the publication of the report of the Committee on Orthodontic Education, resolutions were passed by several well-known orthodontic societies registering their protest against short postgraduate courses given by individuals. In another instance, resolutions have protested all postgraduate courses, regardless of the duration of time except those given under the auspices of universities which are engaged in the regular routine of professional educational activities.

Other resolutions which ostensibly reflect another approach to the situation on orthodontic education have recently been passed by a newly formed society for the study of orthodontia, the North Atlantic Orthodontic Society, which is apparently directly opposed to those passed by the older societies. The resolutions passed by this society have been sent to various dental societies and groups, as well as to dental periodicals. It condemns the resolutions of the older societies, which attempt to prohibit orthodontic short courses, extension courses, and graduate courses other than those sponsored by universities. In an appraisal of the situation and in explanation of its resolutions, it asks, "Why have the orthodontists made a cult of their specialty? Why all the mystery?" In addition to this, the finger of scorn is pointed in saying that orthodontists as a group have made less concerted effort to bring their increased knowledge to the dental field than has any other group of specialists; further, it is said by one of the society's spokesmen, who is secretary of the organization, that the art and the science of orthodontia have not been standardized, that there are different technics with their different sponsors, each claiming infallibility. It is asked, "Under these circumstances, who then can have the temerity to say who shall or who shall not teach, and who is best fitted to practice orthodontia?"*

Here is a situation, which has been arising for at least forty years, sharply focusing itself now; a case of the plaintiff versus the defendant, so to speak, each feeling he is correct in his appraisal of orthodontic education. On the one hand, there is what might be called the case of the orthodox orthodontists struggling upstream to maintain a high standard of efficiency and service in order to offset the possibility of the work's being cheapened and dragged in the mire of inefficiency and carelessness, which they know after years of experience to be the end product of amateur or poorly trained orthodontic talent. It has been said of the late Dr. Angle, who was probably one of the most outstanding and inspirational teachers of the subject, that he was forced not by choice to depart in the teaching of orthodontia from the remainder of the profession of dentistry and from dental schools. It is said that he realized that fundamentally the practice of dentistry and that of orthodontia must separate at a certain point; that they have a common basis in the principles of anatomy and biology and other sciences, but they reach a point of divergence. Dentistry is interested in disease, while orthodontia is more interested in biology and the development of the human denture. In other words, Dr. Angle first realized that the problem was altogether different from that

*Le Blanc: Dental Cosmos, October, p. 1053, 1934.

of the general practice of dentistry, and he encouraged and advocated intensive study to solve orthodontic problems.

Among orthodontists unquestionably there has been sincerity of purpose; this is exemplified in the formation of the American Board of Orthodontia by the American Society of Orthodontists, which has for its purpose the unofficial qualifying of orthodontists as to their ability by a board composed of men within the specialty itself and not by statute.

On the other hand, there is the other side of the problem in which the intensive and at times almost fanatical efforts of orthodontists to uphold quality education is interpreted by some possibly as more or less "high hat" or perhaps bourgeois movement among specialists as a self-preservation gesture.

There can be no doubt as to the sincerity of purpose on the part of the older orthodontic societies which have passed resolutions to maintain a high standard of orthodontic education; however, grave doubts can be raised as to the prudence of passing resolutions which propose that all orthodontic education be placed within the hands of universities when the entire past development of orthodontia has been erected largely on the significant contributions from private individuals and practitioners; and these have been for the most part of a highly savory rather than unsavory character. There can be little doubt as to the sincerity of purpose since for the past ten years orthodontists have spent thousands of dollars on the biologic and physiologic phases of growth and development. Intensive research which has been largely paid for privately has been carried on for years on the problem of root resorption alone; other problems have been investigated by research workers, for example, tissue changes incident to root movement. Collectively all this research amply proves that orthodontists as a group are enthusiastic and intense in their ambition to solve their many problems in treatment.

In the 1934 issue of *Fisher's Orthodontic Directory,* which was edited by Dr. Claude R. Wood with considerable pains and precision, the following information can be readily gleaned so far as the situation in the United States is concerned (and it is in America that the resolutions of protest against postgraduate courses in general have been passed). There are 502 individuals in America listed in the Directory who have received their training in individual private schools of orthodontia, that is, schools which are primarily inspired by one individual's energy. There are 117 individuals listed who have received their training in the so-called university schools, that is, courses which are sponsored by university institutions. In addition to this, there are 285 of those listed in the Directory who do not claim to have received formal postgraduate instruction of either the university or the private school type. However, it seems reasonable to suppose that many of this latter group at some time or another possibly have been associated with some other orthodontist; and, if this is true, the majority of these belong to the private group. In studying these figures, it is manifest that 55 per cent of the orthodontists in the United States received their training from private schools; 31 per cent who specialize have not received formal training in either private or univer-

sity courses. This leaves 14 per cent who have received their orthodontic training from courses sponsored by universities.

The resolutions drawn by the older orthodontic societies plainly have for their purpose the discouraging of individuals who make a business out of orthodontic instruction, to baffle those who may offer courses to graduate dentists and who attempt to secure students regardless of the merits of the course or the sincerity of purpose of those giving such work. The ultimate purpose of such resolutions is no doubt commendable, but their timeliness and consistency are questionable when we look at the record of orthodontic education.

In order to practice orthodontia in the United States of America and to comply with the statutes governing such practice, it is necessary, of course, first for the practitioner to graduate from a dental school and receive a diploma therefrom. Then, following this, he must pass the state board of dental examiners in the state in which he desires to practice. In other words, the statutes applying to the practice of dentistry also apply to the practice of orthodontia because orthodontia, technically, is a department of dentistry. As long as this situation exists, to insist that instruction in a department of dentistry may be secured only at accredited schools is like telling the practitioner of medicine that if he desires to improve himself in the removal of tonsils, he may secure such information only in designated places regardless of what place he may feel is the most important and practical source of such information for him. He might believe it the Mayo Clinic, or he might feel he could satisfy his requirements better in Vienna or Timbuctoo under some organization or individual whose opinion was well regarded in the subject of the removal of tonsils.

When it is recalled that approximately 86 per cent of the orthodontists of America have received their training from independent and private sources, it is perfectly just and natural that some should believe that these sources, collectively, have been far from failures; and also in retrospect it is plain that there have been traditions, atmosphere, and enthusiasm from some of the courses. It is difficult to estimate their significant importance in the advance of orthodontic progress.

In conclusion, let us summarize several obvious points: First, the universities are the logical places to solve orthodontic education; however, up to the present time they have offered little if any solution for the man in general practice who desires to include orthodontia in his everyday work. Second, a problem of this character necessarily must be solved by straight thinking, accompanied by no manifestation of selfishness; and the proper solution is that which best serves both the public and the child patients. The menace of laboratory orthodontic treatment has gained momentum, and the reason it has grown so rapidly is that orthodontic education has not been well grounded within the dental profession.

H. C. P.

BOOK REVIEW

Dental Index of Dental Periodical Literature

The new volume of *Dental Index of Dental Periodical Literature* compiled by Arthur D. Black, A.M., M.D., D.D.S., Sc.D., has appeared. The volume covers a five-year period of dental literature 1906-1910, and is the twelfth of the series to be published. The first volume covered the literature for 1911-1915, the second 1916-1920, the third 1839-1875, the fourth 1876-1885, the fifth 1886-1890, the sixth 1891-1895, the seventh 1921-1923, the eighth 1924-1926, the ninth 1896-1900, the tenth 1901-1905, and the eleventh 1927-1929.

The Index is prepared on the plan of the Dewey Decimal Classification, and the original draft was made in 1898. It was realized by Arthur D. Black many years ago that a very considerable library of dental periodicals was almost useless because it was practically impossible to find an article which had been written upon any subject. A study of the situation made it apparent that much valuable work needed for the future development of the profession would be lost if a plan were not formulated by which the writings of the past could be made easily accessible. It seemed to be of great importance to the progress of the profession. The Dewey Decimal Classification was selected as best adapted to the purpose. This work was begun in 1898. In order to test out and adjust the plan to the literature, the articles in the *Dental News Letter,* 1847-1859, and the *Dental Cosmos,* 1859-1902, were indexed. This required 25,741 cards for subject and author catalogues, and about 1,200 hours were devoted to this task during the years 1898-1903.

In the development of the plan of classification, it was realized that the classification must be made to fit the literature, rather than to attempt to adjust the literature to what might be considered an ideal classification. The wide range of journals indexed, covering almost the entire period of dental journal literature, and the satisfactory use of this Index over a period of nearly twenty years by many individuals in the preparation of essays, by the editorial department of the *Dental Cosmos,* and in a school library, have proved its worth. There was no hesitation, therefore, in using this plan for the larger task of indexing all the periodicals published in the English language, and it is thought that it will be generally accepted as thoroughly practical.

Dr. Abram Hoffman has rendered his services as Secretary-Treasurer of the Index Bureau as well as in the handling of the finances, and supervision of the printing and distribution. Dr. Hoffman has made reference to the dental organizations and members of the profession who have made the publication possible by their liberal contributions.

The Index has rapidly developed to the point where it is one of the most valuable contributions ever prepared pertaining to the science of dentistry, and the profession should be deeply indebted and appreciative of the painstaking ef-

forts and infinitely detailed work which have been done by those responsible for this publication.

It is published by the Dental Index Bureau, 381 Linwood Ave., Buffalo, New York, under the auspices of the American Association of Dental Colleges, American Dental Association, Research Commission of the American Dental Association, British Dental Association, Canadian Dental Association, New Zealand Dental Association, and Society of Dental Science of New South Wales, 1934.

NEWS AND NOTES

Dental Society of the State of New York

The Society will hold its Sixty-Seventh Annual Meeting June 12-15, 1935, at Saranac Inn, Upper Saranac, N. Y.

A cordial invitation is extended to all ethical dentists to attend the sessions.

The following preliminary information is presented:

Dr. H. J. Burkhart, Chairman of Program Committee
Box 879,
Rochester, N. Y.

Dr. L. L. Abbey, Chairman Clinics Committee
619 Union Street,
Schenectady, N. Y.

Dr. H. R. Mead, Chairman Exhibits Committee
619 Union Street,
Schenectady, N. Y.

Further information may be obtained by writing to:

Dr. Augustave Neuber, President
619 Union Street,
Schenectady, N. Y.

Dr. A. P. Burkhart, Secretary
57 E. Genesee Street,
Auburn, N. Y.

Midwinter Meeting of Chicago Dental Society

The Midwinter Meeting of the Chicago Dental Society will be held February 18 to 21, inclusive, 1935, at the Stevens Hotel.

Carroll W. Stuart, Secretary
108 N. State Street
Chicago, Ill.

Notes of Interest

Dr. Abraham Lees announces the removal of his office to 745 Fifth Avenue, New York, N. Y. Practice limited to orthodontia.

Dr. Rolland C. Billeter announces the opening of offices at 605 Post Building, Battle Creek, Mich. Practice limited to orthodontia.

Dr. Oliver Wilson White announces as associate, Dr. James Hilliard Hicks, in the practice of orthodontia, 213 David Whitney Building, Detroit, Mich.